# ELECTRICAL REVIEW

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## Electric Light, Power, Telephone, Telegraph and Scientific Progress.

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### The Electric Light in Warfare.

Remarkable progress has recently been made in this country in the application of electricity to purposes of warfare, and work of a very high order has been done at the Government torpedo station, where a long and elaborate experimental course has been carried out. The electric light, especially, is coming to play a most important part in modern warfare, and American investigators in this field, many of whom have contributed so materially to its present state of development, will be interested in the report of some experiments which took place in the Solent, England, last week. As a better means of defending the roadstead an electric search light has recently been erected on the Spit, near Hurst Castle, opposite the Needle's passage, and six gunboats, with several torpedo craft, tried, under cover of night, to effect an entrance from the westward, without being perceived. The attempt was a failure, as each vessel was spotted by the powerful light when miles off, and the guns were all ready when they came within range. To make matters worse for the attacking flotilla, the smoke which they created in profusion, so as to prevent the ships from being seen, was blown astern by the wind, and the result was a complete victory for the electric light.

### What One Electric Bell Did.

A Cambridge gentleman was asked to buy a ticket to the firemen's ball, and good naturedly complied. The next question was what to do with it. One of his two men servants would probably be glad to use it, but he did not wish to show favoritism. Then it occurred to him that he might buy another ticket and give both his servants pleasure.

Not knowing just how to proceed he inquired of a policeman where the tickets were to be had. "Why don't you go down to the engine house?" said the officer, "the men all know you."

So the old gentleman went to the engine house; but when he entered there was no one in sight. He had never been in such a place before, but was perfectly familiar with the use of electric signals. On the side of the room there was a button, evidently connected with a bell, and, naturally enough, after waiting a minute or two he put his thumb upon it.

The effect was electrical in every sense of the word. From the air overhead—so, at least it seemed to the old gentleman in his bewilderment—men began to rain down, completing their toilets as they fell. The horses rushed out of their stalls, and, in a word, all the machinery of a modern engine house was instantly in motion.

Amid all this turmoil stood the mild mannered and innocent old gentleman, who, even now, did not suspect that he had touched the fire alarm. The men rushed upon him for information as to the whereabouts of the fire, but when he opened his mouth it was only to say, in the mildest accents:

"I should like to buy another ticket to the ball, if you please."

The situation was so ludicrous that no one could be angry, not even the men whose nap had been broken into, and the old gentleman bought his ticket and departed in peace.

### Infinite Variety of Electrical Applications.

Few persons realize the limitless scope of electricity, and the part it is coming to play even in our own age. Unused and disused water is everywhere coming under the yoke of the dynamo. Mountain streams in Switzerland, which have never before been used for any purpose except that of contributing to the pleasure of sight-seers, are now supplying power to mills five miles distant, and the manufacturers of that country are having a great revival. In our own country an important utilization of power will shortly be carried into effect. The "Dalles of the St. Louis" are a series of cascades some miles in length, over which the whole volume of the river precipitates itself, a few miles west of Duluth, and the total fall is more than 500 feet. It is proposed, with a single dam at this point, to run all the street cars in Duluth, to furnish electric light for the city, and to supply a large amount of power for other uses. What cannot fail to open the eyes of the public to the marvelous possibilities of electricity is the proposal of the Electro-Automatic Transit Company, of Baltimore, to construct an electric railway that will run at a speed of three miles a minute, or 180 miles an hour. The morning papers may thus be delivered for the breakfast table, and the evening papers before supper time at distant points. Letters will be delivered almost with the promptitude of the telegraph, and the mails between New York and Omaha will be carried in a night. Although it is intended that at first this railroad shall carry only mail and light freight, it is the purpose of the managers of the company to ultimately adapt the system to passenger traffic, *i. e.*, as the success of the enterprise gives the public sufficient confidence in its feasibility.

### The Future of the Steam Engine.

In a recent issue of the *North American Review*, Prof. R. H. Thurston, of Cornell University, an authority on the subject of steam engines, expresses it as his opinion that this invention is capable of vast improvement, and that it has not yet begun to exhaust its inherent powers. On the basis of greater developments in the application of inventions to the steam engine, Professor Thurston predicts that the next generation will see it consuming one pound of fuel per hour for a single horse power; that ships of 20,000 tons will be driven at the rate of 40 miles per hour; that the American continent can be spanned by flying trains in two days, and that transportation between the cities of the Atlantic and those of the Pacific coasts will be so cheap that the general average of living will be vastly improved upon what exists to-day.

### Improvements in Police Calls.

One of the latest improvements that has yet been made in the police patrol system is an invention of Charles Plumb, superintendent of the electric department, City of Buffalo. The invention consists of a small dial placed on the door of the inside call-box, which by turning the hand to the words "Slow" or "Fast," as may be desired, will send in the alarm for the wagon as the officer wishes. The value of this improvement can be better estimated when the present plan is described. When an officer makes an arrest, and whether the prisoner is troublesome and requires watching or not he must send in a slow call for the wagon. To do this he must draw from his pocket a key to the outer door of the patrol-box. In unlocking the door his key is automatically fixed into the lock of the door. He must then take a smaller key, which is attached to the larger one by a brass chain, and place it in the opposite side of the lock from that in which the first key is placed, and this unfastens the first key. Then he takes the second key and opens the call-box and pulls down a hook, which sends in a slow call. This operation occupies considerable time and attention and is difficult when the officer must, as in many cases, do it with one hand and keep the other on a squirming and troublesome prisoner. The opinion of all the officers and the heads of the department seems to be that the invention is the best that could be devised for the purpose.

Fig. 3.—New Type Perret Motor.

### New Features of the Perret Motors and Dynamos Manufactured by the Elektron Mfg. Co.

The chief distinctive feature of these machines is in the method of constructing the field magnet, whereby the well known advantages due to lamination and to the best quality of iron are secured, while the cost, which has heretofore been a bar to the commercial use of such magnets, is reduced nearly to that of forgings.

This method of construction is peculiarly adapted to machines of small size, and by its use their efficiency is greatly increased, as a test will show. It may also be used to advantage in machines up to ten h. p. and even higher, as by the ingenious shape and arrangement of the plates a magnet of large size may be built up of comparatively small plates, which are stamped from sheet iron, no other machine work being necessary. Eight sizes ranging from ½ to two h. p. are now on the market. Others are in preparation.

In the $\frac{1}{16}$, $\frac{1}{8}$ and $\frac{1}{4}$ h. p. sizes, a magnet of the ordinary U shape is used in which the plates are so formed and put together that the limbs may be swung apart and clamped to the face plate of a lathe for winding, after which they are swung back and bolted fast.

Fig. 1 shows one of these motors complete.

Fig. 2 shows the magnet before winding.

In machines of ¼ h. p. and upwards the double horseshoe shape, with consequent poles, is used. These are shown in Fig. 3. Upon removing the two bolts which pass through the yoke, the top half of the magnet may be separated from the lower half. Each half is then attached to a lathe or other suitable machine and wound by revolving it, after which they are put together and the bolts, replaced, all these operations being very simple and very rapidly done.

One of the plates of which these magnets are built is shown in Fig. 4. Four of these are necessary to form the complete enclosure. See Fig. 5. It will be noticed that the plates interleave at the yoke, at which point their cross-section is enlarged and they are clamped firmly together by bolts. Little or no magnetic polarity is found at the yoke, which shows that the joint is good.

An important feature is the extremely low resistance of the magnetic circuit, which is due partly to superior quality of iron, the use of which is allowed by this construction, and partly to the smallness of the air gap between the pole pieces and the iron of the armature, which is of the drum type, with teeth. In the longitudinal recesses formed by those teeth the armature coils are wound.

This construction increases the efficiency, allows a large reduction in armature speed and improves the regulation. As showing this, reference is made to the ½ h. p. machine (Fig. 3) which weighs, complete with pulley, 70 pounds, and has a commercial efficiency of 80 to 85 per cent. As a shunt wound dynamo it will generate a current of four amperes at 110 volts, when run at a speed of 1,800 revolutions per minute.

The armature is wound with 7,000 inches of conductor, which is at the rate of about 64 inches per volt at the remarkable low peripheral speed of 1,500 feet per minute. This showing, we believe, to be rarely equalled in machines of the largest size.

It may further be stated of the ½ h. p. machine that the drop in electro-motive force when run as a dynamo, and the variation in speed as a motor, are less than five per cent. between full load and no load. (See details of Prony Brake test.)

The motors are usually shunt-wound, and on constant potential machines run at practically a constant speed, regardless of changes in load. In several instances parties requiring regulation so close that they believed compound winding absolutely necessary, have been induced to try the Perret shunt-wound machines, and have found them to fully meet the requirements.

This superior regulation is due to the fact, not always given its full weight, that the regulation of a shunt-wound machine depends not only on the internal resistance of the armature coils, but also to an equal, if not larger, degree on the intensity of the field. In other words, they lower the internal resistance of the armature coils, and the lower the resistance of the magnetic circuit, the closer the regulation.

This is clearly demonstrated by recent experiments with a ⅛ h. p. motor on a 110 volt circuit, which, with an armature without teeth, the air gap being $\frac{3}{16}$ of an inch and the internal resistance 11 ohms, showed a variation in speed of 15 per cent. between no load and full load, while with an armature having teeth by which the air gap was reduced to $\frac{3}{32}$ of an inch, but with the internal resistance of armature increased to 20 ohms, showed a speed variation of only 11 per cent. The same thing is shown by the performance of the ½ h. p. dynamo cited above and also by Prony Brake test of ½ h. p. motor.

It is, of course, not claimed that the use of toothed drum armatures is new, but Mr. Perret finds that they possess some decided advantages over plain armatures in addition to those already stated, as, for instance, positive driving of the coils secured by winding them in the recesses; also he finds that when used with finely laminated field magnets they are free from some disadvantages experienced in other constructions. It is quite certain that such armatures running in close proximity to solid pole pieces would produce heating effects therein which would be wasteful and very troublesome, to say the least. With laminated field magnets all trouble of this sort is avoided.

A strong point in favor of these machines is freedom from sparking at the commutator, provided this is kept in reasonably good condition, and the brushes having been once set at the non-sparking point require no changing under extreme changes in a load. A rocker arm for the brush holders is therefore unnecessary, and the machine is by so much the simpler. The reason for this will be readily seen by electricians in the foregoing description, and lies in the fact that the magnetism of the field is so powerful relatively to that of the armature that no distortion of the lines of force is produced, and consequently the line of commutation remains unchanged regardless of changes in load.

A prominent electrician connected with another motor company was heard to remark after testing some of these machines, that they were "harder to knock a spark out of than any he had ever seen."

It may be said further that these machines have been worked out very perfectly in every detail, and a high degree of mechanical skill is shown in their construction.

The armature shafts are of high grade steel. The bearings are all accurately fitted, and are very long in proportion to their diameter, being, in the smaller sizes, of hard composition, and in the larger of Babbitt metal.

The commutators, which ordinarily are liable to great wear and damage, have received particular attention, being made of a special hard bronze.

All the motors are provided with switches for starting and stopping, and in the larger sizes the switches are provided with resistance coils, an arrangement which is much handier than a separate rheostat.

In respect to simplicity, they are excelled by none, all parts needing attention being in plain sight and easily accessible. The armatures may be removed for inspection or any other purpose, replaced in running order in less than one minute. All parts are made to standard gauges, and are interchangeable.

DETAILS OF PRONY BRAKE TEST ½ H. P. PERRET MOTOR.

| Brake H. P. | Speed. | Commercial Efficiency. |
|---|---|---|
| .146 | 2050 | .73 |
| .185 | 2048 | .74 |
| .219 | 2046 | .745 |
| .250 | 2044 | .76 |
| .290 | 2042 | .77 |
| .320 | 2040 | .78 |
| .365 | 2035 | .79 |
| .400 | 2030 | .80 |
| .432 | 2024 | .81 |
| .467 | 2018 | .815 |
| .501 | 2010 | .82 |
| .535 | 2000 | .80 |
| .569 | 1995 | .78 |
| .600 | 1980 | .76 |

## And He Was an Englishman.

Joshua Rose has been writing some very interesting letters to the *Scientific American* regarding things seen by him at the Paris Exposition, and in one of these he took occasion to speak of the extent to which American machinery was copied by English and Continental machine builders, and made a very unfavorable showing, especially for the former. Now comes one of our English exchanges and heaps ridicule upon Mr. Rose, calling him our "American critic," "the intelligent Yankee," and "the great Pajandrum," whatever that may be, and winding up by congratulating itself that "all American critics are not wrapped up in such utter and monstrous conceit as this representative of the *Scientific American* in Paris!" The joke of all this will no doubt be fully appreciated by those aware of the fact that Mr. Rose is a thorough Englishman, born and raised in that country, and now living in London, but having been in this country sufficiently long to make him familiar with American practice in these matters.—*American Machinist.*

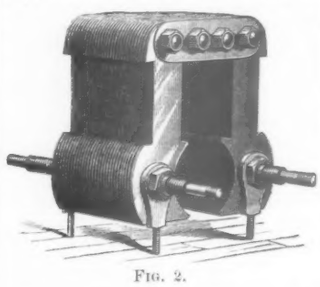


FIG. 2.

* * Capitalists of Des Moines, Iowa, write they would like to put in an electric street railway in Aberdeen if a good and satisfactory franchise is furnished them. They are willing to make the investment for what it is worth in future years, but are not inclined to pay anything for the privilege of so doing.

## Electricity as a Means of Execution.

FURTHER TESTIMONY IN THE KEMMLER CASE—MR. EDISON'S OPINION.

The taking of testimony in the Kemmler appeal case was continued last week. One of the first witnesses was Mr. Thos. A. Edison, who was called by the State There was quite a crowd in Mr. Bourke Cochran's office, where the testimony was taken. In response to questions, Mr. Edison gave his calling as that of inventor, and stated he had devoted about 26 years to electricity. He was asked the difference between continuous and alternating electric currents and said:

A.—The continuous current is like the continuous flowing of water through a pipe in one direction.

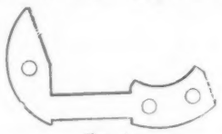


FIG. 4.

The intermittent current is like the flowing of water through a similar pipe for a given time in one direction, then reversing and flowing in the opposite direction for a given time, and so on. I believe that in the Westinghouse dynamo system there are about 150 alternations or reversals of the current a second.

Q.—What is your opinion of the accuracy of the Wheatstone bridge in measuring the resistance of the human body? A.—It is accurate more so than the foot rule for measurements of length.

Mr. Edison described experiments made "day before yesterday," which Mr. Cockran noted, with an ejaculation of surprise, was Sunday, at the laboratory at Orange, upon 250 men, employés in the works and neighbors. The average resistance, Mr. Edison said, was 1,000 ohms, the extremes being 1,800 and 660. The tests were made by immersing the hands in Leyd enjars, each containing an electrode and filled with a solution of caustic potash. The potash was used to saponify the natural oil upon the hands and make contact perfect.

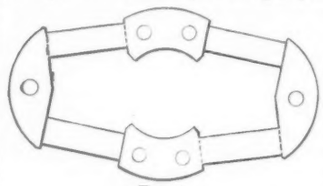


FIG. 5.

Q.—It is your opinion that the high figures of resistance which have been quoted to us here as the results of other experiments were due to imperfect contact? A.—Yes, there are enormous variations caused by the conditions of the skin. These make a tendency to high figures. But by overcoming the effect of the oil and dirt upon the hands with the saponifying potash there is a normal condition obtained and a more perfect contact secured.

Q.—Where is the major part of the resistance in the human body? A.—Through the arms and breast. I should say that about 15 per cent. of the resistance is at the points of contact and the rest through the body.

Q.—What is the law with regard to the paths of varying resistance? A.—The current distributes itself according to the resistance, the most going where there is the least resistance.

Q.—Has Harold P. Brown any connection with yourself or the Edison Co.? A.—Not that I know of.

Q.—Can an electrical current be generated by artificial means so as to cause death in every instance? The answer was a nod of the head.

Q.—Instant death? A nod.

Q.—Painless? Again a nod.

Q.—What method would you suggest for the execution of criminals? A.—Put their hands in Leyden jars filled with caustic potash, the jars, of course, having wires attached from the dynamo.

Q.—How much current would you use? A.—1,000 volts.

Q.—Any kind of current? A.—No.

Q.—What kind? A.—Either an alternating or one that is very much interrupted. The interruption of the continuous current could be obtained by mechanical means.

Q.—Why use an alternating current? A.—Because it seems that you can take more of a continuous current and not feel it. You could take eight volts of the continuous, but three would be as much of the alternating as you could stand.

Mr. Edison told at length of using some muscular tissues in experiments, and said he thought there would be a powerful rush of fluid through the capillary pores, first one way, then another. He said that he had made a telephone on this principle, but the lawyers didn't question him about his operations. In fact, the lawyers seemed more cautious about the inquiries made of Mr. Edison than of other experts.

Q.—How would heat be distributed in the application of electricity? A.—It would be radiated. It would cause a rise in the temperature of the body.

Q.—Mr. Pope, an electrician here the other day, testified that a sufficient current would carbonize a man's body from one end to another; that the moisture at the electrodes would be converted into boiling water. Is that possible in the use of proper electrical apparatus? A.—I don't understand. I don't see how it could be.

Q.—In electrical executions, would the burning happen in case death happened instantly? A.—No.

Mr. Cockran then took Mr. Edison in hand for cross-examination and asked if he could measure the resistance of a piece of clay filled with a heretogeneous collection of metals. Mr. Edison said that if Mr. Cockran gave him the job of measuring a plate of zinc one inch square in the centre of a mile of iron he couldn't do it because he couldn't get at it. Mr. Cockran insisted upon his question. Mr. Edison said that the question was nonsense, and he couldn't answer it the way Mr. Cockran wanted it answered because it was nonsense, but he could obtain a measure of the whole conglomerate, not of the clay alone, nor of any of the metals alone.

Mr. Cockran made the point that in the measurements of the 250 men just made at Orange to determine resistances no man had been measured twice to see if he varied. "Are you sure," asked Mr. Cockran, "that the Wheatstone bridge would record the same resistance to-day and to-morrow on the same body?"

"I think it will be the same," was Mr. Edison's answer. "But you don't know," persisted the lawyer.

"No, but I will try to-morrow," replied Mr. Edison with earnestness. Then there was a laugh, the echo of which had hardly died when Mr. Cockran asked what would happen in case Kemmler should be kept on the chair several minutes with the current working at him all the while?

"He would be mummified," answered Mr. Edison.

"Well," said Mr. Cockran, "that is a new thing. The others have testified that he would be carbonized. What do you mean by 'mummified?'"

"That the fluids in his body would all be dried out."

Mr. Cockran got Mr. Edison to say that an ampere would be sufficient to kill. "And you think a man who would take more to be killed would be mean and rapacious?" inquired Mr. Cockran.

"Yes," said Mr. Edison, "mean and rapacious."

Finally Mr. Cockran alluded to the rivalry between the Edison and the Westinghouse companies, and asked Mr. Edison if there was much affection between him and Mr. Westinghouse; if he loved Mr. Westinghouse as a brother. There was more than usual stillness, followed by Mr. Edison's answer, "I think Mr. Westinghouse is a very able man."

Mr. A. E. Kennelly, of Edison's laboratory, then testified as to the experiments on dogs and the recent measurements of men at the laboratory.

Mr. L. Adams told of his experience with lightning as follows:

"While I was at the tea table with my uncle, 70 years of age, my wife and three sons and two daughters on the evening of April 10 last, a bolt shot down the chimney. We had finished supper and had shoved back from the table. My chair was tipped back on its kind legs and my fingers were interlocked on the top of my head. The next I knew I was in the yard lying in the rain. One of my sons had carried me there after the bolt struck me. I was paralyzed for three days and did not leave my bed for three weeks. My uncle and one of my daughters were struck and they died the day after the storm. My wife also was struck but she has recovered. The same bolt, we found afterward, had torn the chimney to pieces in the attic, broken the dishes on the table and scattered the knives and forks, struck three trees near the house and split a log to pieces in a woodpile 20 feet from our front dor.

"I never knew what hit me," Mr. Adams continued. "From its marks left on my body I found that the bolt had struck me on the head, and the electrical fluid ran down each arm to my breast, where it divided again and a part skipped over my abdomen on the left side and striking my thigh ran down my left leg and passed off at the heel, tearing the shoe to pieces. Part of the charge went down my right side, skipping the abdomen also, and jumped from right knee to the floor, doing no damage to me below the right knee. I got a bad burn also on the back of my neck.

Q.—Did you suffer much after you were struck by lightning? A.—I suffered frightfully.

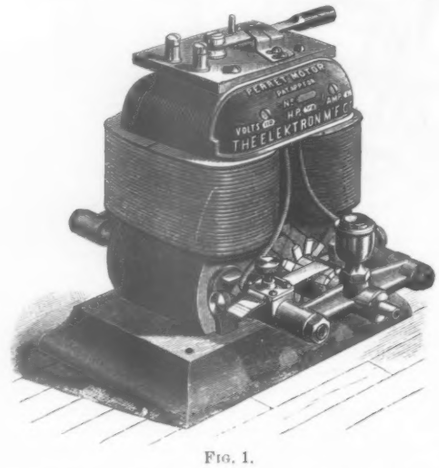



FIG. 1.

Dr. Cyrus Edson, of the Board of Health, was called by Deputy-Attorney General Poste. Dr. Edson said he knew a good deal about electricity, having witnessed experiments with it and used it in his practice. He took part in the experiments on dogs in the School of Mines. He described these experiments anew.

"Two dogs," he said, "died at once under the heavy charge, but one did not die at once, because we wanted to experiment on a feeble current, and increase it gradually. The dog was thrown into convulsions, and as the persons present seemed to be moved by the animal's sufferings it was at once put out of its misery by a powerful shock."

"Brutal, brutal!" exclaimed one of the spectators.

"You are a vivisectionist?" queried Attorney-General Poste.

"I have done a good deal in that line," said Dr. Edson.

Q.—Did you dissect the dogs? A.—Yes, one of them. They were all dead, killed by electricity. All the cause of death to be discovered was that the heart had stopped beating while contracted.

Q.—Do you think death could be brought about artificially without pain. A.—Yes.

Q.—How much electricity would be required to kill a man? A.—Less than half an ampere.

Q.—How much voltage? A.—Six hundred or 700 volts.

The Referee—A witness has testified that a person might be suspended by the feet from an electric light wire through the current contracting the muscles of the feet and making them prehensile. Do you think that possible? A.—No.

By Mr. Cockran.—What is the cause of death by electricity? A.—I think it is a paralysis of the nerve centers, but I don't claim to know.

Q.—In fact, you don't claim that you are discussing an exact science? A.—N-no, I don't think electricity is an exact science now.

Q.—You would not be astonished if at some time the effect of an earthquake could be produced at will by electricity? A.—No.

Q.—And with regard to the human body the science is equally undeveloped? A.—Hardly so far as that. I think we know that electricity will kill if properly applied. We know that because animals have been killed under certain conditions.

Q.—Ah, but could you, by seeing what would be fatal to an animal, tell certainly what would happen to a man? A.—No.

Dr. Rudolph A. Witthaus, Professor of Chemistry and Physics in the University of the City of New York, testified that he did not agree with Dr. Saches, who had declared that death resulted in electrical cases from a chemical change in the blood. He proceeded to state reasons for his belief in language so technical that when he had finished and Attorney-General Poste asked Lawyer Cockran if he wanted to cross examine the witness, Mr. Cockran said, "I would if I had understood a word he had been saying," and then addressing the witness:

Q.—Prof. Saches has his theory about this business? A.—Yes.

Q.—And you have yours? A.—Yes.

Mr. Cockran—I congratulate you both. [Laughter.]

### A Horrible Experiment.

Under the above heading the New York *Sun* editorially comments as follows on the electrical execution situation:

It is hard to conceive of a more horrible experiment than that which will be made on Kemmler, if his sentence of death by electricity is carried into effect.

In a secret place, he will be compelled to go through a process of mental and moral, if not also, bodily torture, and nobody can foretell how long it will last. Instead of the one hangman of ancient and odious memory, there will be required for Kemmler a force of electrical executioners.

According to the explanation of Mr. Brown, the deviser of the killing machine, it is of such intricate construction and its manipulation is so complicated and delicate that only expert electricians will be competent to operate it. Prison attendants may lead the condemned man from his cell to the secret place of experimenting, and they may pinion his arms and strap him to the chair; but the rest of the job will be scientific, and expert electricians, two or more, will have to perform it. They must put on the helmet, arrange the sponges, see that the piece of dentist's rubber is properly wound around the head, pour in the chemical solution, and test the resistance of the subject of the experiment with the Wheatstone bridge. As they will not be experimenting on a dog, but on a human being like themselves, they are not likely to enjoy the business.

It is true that here and there has been found a Sheriff of a quality so coarse that he has saved a few dollars by hanging a man himself instead of hiring a professional hangman; but to the credit of human nature, the number is small. The business of hangman is profitable, and under the law it is necessary, and yet it is hard to get any competent man to go into it; and when one is found he usually travels from place to place, perhaps from State to State, to do his detested work, so few are his competitors. Men shrink away, women turn pale, and children are terrified when they encounter a known hangman.

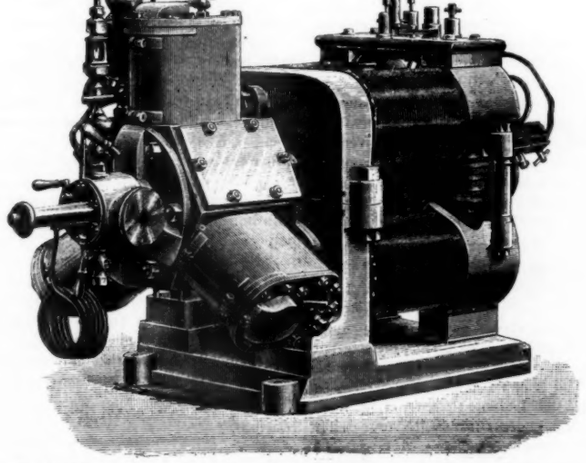
Yet Mr. Brown's machine can only be operated properly under the immediate direction of educated men, expert electricians. If the experiment is to be made on Kemmler it must, of course, be conducted by men so equipped with the assistance of experienced subordinates.

In order to demonstrate the efficiency of his machine against hostile professional criticism, of course Mr. Brown himself will be obliged to superintend the job; but we doubt very much whether he will find many volunteers among electricians to assist him at his horrible work.

### Mr. Brotherhood's Three-Cylinder Engines at the Paris Exhibition.

To our progressive contemporary *Industries*, of London, we are indebted for the illustration of the Victoria dynamo and three-cylinder engine now on exhibition at the *Exposition Universelle*, Paris. Two purposes for which these are supplied are shown, both naturally being intended for use on shipboard. In the one case the engine is shown arranged to drive a dynamo, as supplied by Mr. Brotherhood for use in torpedo boats. The dynamo in question is of the Victoria type, and is intended to supply 40 amperes at 60 volts when running at 700 revolutions per minute. The engine, which it will be seen is coupled direct to the dynamo, has 3-in. cylinders, and is intended to work at 700 revolutions per minute. The weight is seven cwt. The other exhibit is a 5-in. three-cylinder engine, arranged to drive a 60-in. fan for ship ventilation.

**Belfast, Me.**—The Consolidated Gas and Electric Light Company has been organized with the following named gentlemen chosen directors: A. K. Pierce, Charles Baker, A. A. Howes, Richard H. Moody, S. Gregor Doran, E. R. Pierce, J. H. Quimby, W. B. Swan, C. B. Hazeltine, Nicholas R. O'Connor and N. F. Houston. W. B. Swan was elected president, and John H. Quimby secretary and treasurer. They propose the "manufacturing and selling of gas and electricity for heat, light, power, and manufacturing of gas and electric apparatus and operating electric motors and other electric apparatus." The capital stock was placed at $40,000, shares at $50 each.



THREE CYLINDER ENGINES VICTORIA DYNAMO AT THE PARIS EXHIBITION.

**Binghamton, N. Y.**—A new local telegraph company has been organized in this place under the name of the "Standard." Its lines connect several private houses and business offices in this place, Lansboro and Oakland. The following are elected officers: President, A. W. Cook; vice-president, B. James; secretary, F. Nicholson; treasurer, J. Gibbs; superintendent, H. E. Blackburn; assistant superintendent, J. Barnes.

**Albany, N. Y.**—The Fort Madison Light Company, capital, $300,000, and the Fort Madison Water Company, capital, $200,000, both to operate in Fort Madison, Iowa, are incorporated with these trustees: Dudley Betts, Joseph Watson, New York; Charles S. Kehan, William S. Cole, Joseph M. Donovan, John F. Foley, Eugene A. Dyke, all of Brooklyn; Hugh M. Gilligan, Plainfield, N. J., and William Wheeler, Bogota, N. J.

**Milwaukee, Wis.**—D. M. Benjamin, Fred N. Finney and Frank G. Bigelow are the incorporators of the Edison-Villard Illuminating Company, which applied to the Common Council for a franchise. The object of the company, as stated in the articles of incorporation, is to manufacture electric light machinery and to maintain an electric light plant in this city. The capital stock of the company is $500,000, divided into 5,000 shares. The incorporation of these articles is the result of the visit of D. Preston Hicks, of New York, to this city.

**New York.**—The Standard Recorder Company, formed by Norvin Green, Logan C. Murray, Thomas L. Watson, and John Jay Knox, of New York, and Henry G. O'Neil, of Louisville, Ky., and John Gilmour, of Owenboro, Ky. They propose to acquire and sell patent rights, to manufacture, sell, and lease apparatus and devices for printing, numbering, stamping, registering, and issuing tickets of all kinds, and for calculating, recording, and registering financial and all other transactions. They will locate in New York. The capital is $500,000. Norvin Green is named as president and general manager, and John Gilmour, secretary and treasurer.

### The Erie Telephone Company.

It is reported from Lowell, Mass., that the board of the Erie Telephone Company has completed negotiations with the American Bell Company for a perpetual contract for the Cleveland and Southwestern Companies, on a basis entirely satisfactory to both parties. This gives the Erie a perpetual right for the entire territory. The terms of the contract for all the sections are given as follows:

Northwestern Telephone Exchange Company—American Bell to own 30 per cent. of the stock, Erie 70 per cent., American Bell Company waiving participation in dividends until January 1, 1890.

Cleveland Company—American Bell will own 35 per cent., Erie Company, 65 per cent., the American Bell waiving participation in dividends until January 1, 1890. Should special funds above earnings be required for new construction or underground work, the American Bell will contribute 35 per cent. toward costs. It will also contribute 35 per cent. toward the cost of the new Cleveland switch, which has already been paid for by the Erie.

Southwestern Company—American Bell will own 30 per cent. of stock, Erie 70 per cent., and Bell waiving dividends until June 1, 1889. The American Bell Company also make the Erie a handsome cash concession.

The average per cent. of the stock for the entire perpetual contract is 31⅔, based upon present earnings of the company of four per cent. The dividends can be maintained after the American Bell participates in 1890. Should the company not increase its earnings one dollar, the dividend paid in November, 1891, after the American Bell proportion participates, in the southwestern section, would be at the rate of 3½ per cent.

**Toledo, Ohio.**—The Toledo Electric Railway Company, Toledo; capital stock, $50,000.

**Fostoria, Ohio.**—The Fostoria Light and Power Company, Fostoria; capital stock, $100,000.

**Canton, Mass.**—The Canton Electric Company; M. F. Morrell, president; H. N. Bates, treasurer; capital, $25,000.

**Albany, N. Y.**—The Alexandria Bay Electric Light Company are arranging to capitalize with a stock of $10,000.

**Boston, Mass.**—A charter has been granted the Massachusetts Pulsion Telephone Company, of Boston; W. F. Johnson, president; W. E. Peabody, treasurer; capital, $10,000.

**Chicago, Ill.**—The Merchant's Light and Power Company, of Peoria, to furnish light, power and heat; capital stock, $35,000; incorporators, B. F. Singer, Joe Burks, K. C. Pardee and others.

**Jonesboro, Ga.**—In Jonesboro, B. Dillon and others have incorporated as the Jonesboro Electric Light, Heat and Power Co., with Marcus Berger, president; J. B. Dillon, Jos. Dixon and J. W. Perkins, directors. The capital stock is $10,000.

**Chicago, Ill.**—The Chicago Electric Battery Company; to manufacture and sell electrical secondary batteries, primary batteries and other electrical apparatus; capital stock, $300,000; incorporators, Fred. W. Stewart, H. S. Waldron and George W. Wylie.

**Pittsburgh, Pa.**—The Duquesne Electric Railway Construction Company, of Pittsburgh; capital $600,000; the stockholders and directors are Wm. J. Hammond, John V. Patton, Wm. J. McElroy, Wm. E. Tustin and Wm. J. Hammond, Jr., all of Pittsburgh.

**Chicago, Ill.**—Chicago and Cicero Water, Light and Power Company, of Morton Park; to furnish water, light and power for domestic, manufacturing and all other purposes; capital stock, $50,000; incorporators, Frank Sayre Osborne, M. H. Burgett and Henry R. Pebbles.

**Pittsburgh, Pa.**—Fifth Avenue, West End and Crafton Street Railway Company, of Pittsburgh; capital, $18,000. The road will be operated by electric power. The stockholders, who are also the directors, are Ross J. Beatty, John W. Magnus and C. L. Netting, Jr., of Pittsburgh, and William J. Post, of Ingram Station.

**Wakefield, Mass.**—The People's Electric Light and Power Company has been organized, and the following officers were elected: President, Edwin C. Miller; directors, Edwin C. Miller, Richard Britton, William E. Rogers, Geo. W. Harrington, J. Fred. Parker, Joseph Connell, Frank A. Clapp; treasurer and clerk, Chas. Williams. The capital stock is $10,000 in shares of the value of $100. There are already 31 subscribers to the stock. The treasurer was authorized to open a subscription paper to the public, but not more than five shares will be sold to any one person, the idea being to make it a genuine people's company. As soon as the stock is subscribed for, the company will petition the Selectmen for a franchise and negotiations will be opened with the Wakefield Water Company looking to room and power.

* * The below named officers of the Electric Motor and Power Company, Manchester, N.H., have been elected: President, Stilson Hutchins; treasurer, George L. Wright, clerk, Joseph W. Fellows; directors, Stilson Hutchins, George L. Wright, John M. Corse, Charles A. Busiel, Joseph W. Fellows.

# ELECTRICAL REVIEW

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☞ No attention will be paid to communications without the *name and address of the writer.*

*We invite correspondence from Electricians, Inventors, and the Telegragh and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.*

*We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.*

*Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.*

**NEW YORK, AUG. 3, 1889.**


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Our entertaining contemporary, *Texas Siftings*, hinges a joke on the appearance of a "coon hole in the ground." The raccoon hunter of the REVIEW never knew before that this interesting animal was in the habit of burrowing. Possibly the black-footed Texas species, *Procyon Hermandezii*, is that kind of a coon; the *Procyon lotor* of the North is generally supposed to house himself and family in a hollow tree trunk.

The REVIEW received two anonymous communications this week. They were meritorious, but until the writers send us their names they will remain carefully ensconced in dark pigeon holes. There is an announcement at the the head of these columns that should convince our readers of the futility of sending in matter unaccompanied by the name of the author.

The Cleveland Telephone Company, Cleveland, Ohio, has been granted official permission to begin the construction of its conduits. The company will begin to break ground next week.

Our readers will welcome the poet who comes with the dynamo as his theme. His first song appears on another page, and comes from Baltimore, the present home of the first practical dynamo manufactured in this country.

Col. H. C. Davis, former president of the Electric Club, and widely known in electric light circles, returned from London on the "Umbria" Sunday, and will make his headquarters in the Equitable Building with his son, Mr. Chas. Davis, the electrical engineer.

The people of the country are expectantly waiting for electricity to bring them rapid transit—say 200 miles an hour. There are a good many fairy tales appearing just now in relation to such wonderful speed—but electricity can, no doubt, furnish it if the running gear can be made to stand it.

A letter from Chairman Benjamin Rhodes states that he has assurances of a large attendance at the Niagara Falls Convention, to be held next week, as well as an exceedingly interesting exhibit. All our readers interested in electric light and electric power should make it a point to be present at this meeting of the Association.

Mr. T. A. Edison has been granted a rehearing in the case of Chief Clerk Pope, of the Canadian patent office, who declared his patents in the Dominion were invalid. The rehearing will be before Hon. John Carling, Minister of Agriculture. It was agreed that the same argument should stand, but the advisability of hearing new evidence is now under consideration.

The preliminary work of the International Exposition has been well commenced. Mayor Grant, with characteristic promptness, has started the good work, and at a called meeting at his office was authorized to appoint committees on finance, legislation, site and buildings, and permanent organization. The electrical industry will be one of the most potent and interesting factors in the success of this great Exposition—a fact that the gentlemen at the head of the movement should not, and we are sure will not, be slow to appreciate. There is no industry in the world to-day that is more progressive or important that the electrical.

At a meeting of the directors of the New England Telephone and Telegraph Company held July 24th, a dividend of 75 cents per share was declared, payable on Thursday, August 15, 1889, to stockholders of record at the close of business on Wednesday, July 31, 1889. The transfer book will be closed from August 1, 1889, to August 14, 1889, both days included. This company, under the able management of Col. J. N. Keller, has come out into the circle of dividend paying companies, and the energetic manager is deserving of full credit for what he has accomplished. In this work Treasurer Boynton has been a valuable assistant.

The Cushman Telephone Company has finally given up the ghost, and will now disappear from telephonic records. At Chicago, July 24th, a final decree was rendered by Judge Blodgett, in the Federal Court, in the long-pending litigation between the Bell and the Cushman Telephone Companies. The Bell Company brought two suits against the Cushman Company for infringement of patent. The decree in both suits is against the Cushman Company. A fine of $1 is assessed against it, and it is ordered to turn over all its telephones to the Bell. If there are any more infringing telephone companies, the Bell would, no doubt, like to hear from them. Just now the supply seems to be exhausted.

Scranton is to be connected with the American Bell Telephone Company's long distance system, which will place the "electric city" on speaking terms with New York, Philadelphia, Boston, Buffalo and other far-away cities.

In 1868 the average charge per message was $1.04. In 1888 the average charge was 31 cents. In 1868 the average profit per message was 41 cents. In 1888 the average profit was 8 cents. There are now about 20,000 miles of telegraph line not owned by the Western Union. These statistics effectually disprove the popular charge that the Western Union, by absorbing rival lines, secured and exercised the power to advance rates. Instead of advancing, the company has steadily decreased rates, until now rates are less than in England, where the Government controls the lines and claims to charge no more than the cost for the transmission of messages.

Dr. Norvin Green, president of the Western Union Telegraph Company, has written an able protest against the action of the postmaster-general in asking that the Government be charged one mill a word for its telegraphic service. It would cost the company, it appears, from seven to ten cents to deliver the messages that the postmaster-general proposes to pay one cent for. We think the wise thing for Mr. Wanamaker to do is to admit the ability of this Government to pay living prices for services received, and to put the rate back where it was before—to one cent a word.

There are a number of learned editorials appearing in our country exchanges, apparently explaining to their readers the meaning of electrical terms and showing what electricity really is. This deluge of information is evidently inspired by the testimony in the Kemmler case, the testimony in many cases furnishing the information so generously given his readers by the rural "moulder of public opinion." As a rule, the non-electric editor does very well, only occasionally causing a smile when he compares a volt to an inch, or an ohm to a kick of a mule, and writes learnedly of "amphires" and "alterating" currents in a zealous effort to make the matter clear to his readers. One writer suggests that all kinds of criminals be experimented on until we get a basis from which to calculate for future executions—to find out how many ohms resistance a red-headed (and, very probably, red-handed) criminal with blue eyes carries around with him; how many a bald-headed, black-eyed sinner usually has with him; how many a full-whiskered and bespectacled lean man would have, as compared with a hook-nosed 300 pound villain with a well tanned skin! The idea is not without merit! It might take some time to get enough data to answer for all time and all cases, but that need not deter the wise men who foisted this obnoxious and sensational law in such unseemly haste on the Empire State.

### *DEATH OF GEORGE S. LADD.*

Mr. George S. Ladd, of San Francisco, Cal., died of dropsy in London last Sunday. Accompanied by his wife he had gone abroad hoping to be benefited by the change, but the improvement was only temporary. Mr. Ladd was one of the leading telephone men of the country, being president of the Pacific Bell and the Sunset Telephone Companies, in both of which he was a large stockholder.

His friends were numerous, his genial presence was always welcome, and he will be greatly missed, not only in electrical circles of the country, but in the social and financial circles of his state.

Mr. John I. Sabin, who has been associated with Mr. Ladd for many years, was in New York on his way to see Mr. Ladd, when he received news of his death from President John E. Hudson, of the American Bell Telephone Company, who is in London. Mr. Sabin will remain in New York until Mrs. Ladd returns with the body, and will not go to London as he first intended.

### *WHAT OUR ENGLISH FRIENDS THINK.*

The investigation in New York in the case of the murderer Kemmler, as to whether or not electricity can be relied upon to cause a prompt and painless death, is being watched with considerable interest in London. A correspondent of the *Pall Mall Gazette* writes to that paper to say that whatever doubts might exist in America, killing by electricity has been reduced to an "absolute scientific certainty" by the experiments of Dr. B. W. Richardson in his "model abattoir at Croydon." It would certainly be reduced to absolute certainty here, given the "model abattoir" and time enough. A furnace at white heat would be "certain" also; no ordinary criminal could be expected to survive roasting.

### *NEW BOOKS.*

**Proceedings of the National Electric Light Association.**—Chicago, February 19, 20 and 21, 1889.

This book has just been issued from the press of *Modern Light and Heat*. It contains a list of the officers and members of committees and verbatim report of the Chicago Convention of this Association. A list of members and of all visitors to the convention, with addresses, is published. The proceedings have been carefully edited and very thoroughly indexed by the secretary and treasurer, Mr. A. V. Garratt, and as a whole comprise a valuable addition to electrical libraries.

### *ITINERARY OF THE SPECIAL TRAIN TO THE NIAGARA FALLS ELECTRIC LIGHT CONVENTION.*

For the accommodation of the delegates from New York State, the special Pullman train, which will leave the foot of Chambers street, New York, for Niagara Falls, at nine o'clock A. M., Monday, August 5, will stop to take on passengers at the following points: Port Jervis, at 11.40 A. M.; Susquehanna, at 2.50 P.M.; Binghamton, at 3.30 P.M.; Owego, at 4.20 P.M.; Elmira, at 5.05 P.M.; Hornellsville, at 6.40 P.M., and East Buffalo, at 9.25 P.M.

Gentlemen and their ladies who find it more convenient to board the train at the above named points can do so by sending one dollar and a half to cover their Pullman seats, to the Headquarters of the National Electric Light Association, 18 Cortlandt street, New York, or to the office of the ELECTRICAL REVIEW.

### *THE CONVENTION PROGRAMME.*

The programme for the Niagara Falls Convention of the National Electric Light Association, to be held at the International Hotel, Niagara Falls, N. Y., August 6, 7 and 8, is announced by the Secretary. The National Committee on State and Municipal Legislation will report through its chairman, Mr. A. R. Foote, on the favorable and unfavorable legislation in this country touching the electric light and power industry. The Committee on Harmonizing Electric Light and Insurance Interests will report through its chairman, Mr. P. H. Alexander, giving very complete statistics on the fire loss on electric light stations, and recommending measures by which insurance rates on stations may be lowered. There will be several other committee reports on vital questions. Dr. Otto A. Moses will address the Convention on the recent movement to introduce the use of electricity as a means of legal execution. Some of the papers to be read and discussed are as follows: "Electric Street Railways," by George W. Mansfield; "Methods of Arriving at the Cost of the Products of a Station," by A. J. De Camp; "An Ideal Station," in two parts, mechanical and electrical, by Marsden J. Perry and John T. Henthorn; "The Economic Size of Line Wire," by Benjamin H. Rhodes; "Station Accessories in the Shape of Measuring Instruments," by C. C. Haskins; "The Value of Economic Data to the Electric Industry," by A. R. Foote; "The Development and Progress of the Storage Battery," by William Bracken; "The Theoretically Perfect Arc Light Station," by M. D. Law; and "The Electrical Transmission of Power," by Prof. E. P. Roberts.

# ELECTRICAL NEWS.

## Boston, Chicago and Other Points.

### OUR CHICAGO LETTER.

**The Club.**—The Electric Club's banquet and formal opening, fixed for the 1st of August, will be a grand and gay affair. The whole of the building and all the upper part of Kinsley's, including that genial smiler, belongs to the Club for that occasion. All his "culled pussons," all his service, of whatever nature, will be the property of the Club from early in the evening till we all go home in the morning.

There will be music and dancing, and flowers, and cards, and billiards, and chess, for those who desire, and there will be gaiety for all.

A general reception committee is composed of A. Kempt, chairman, Prof. Badt, Geo. O. Fairbanks, W. H. McKinlock, D. P. Perry, B. E. Sunny, E. Baggot, C. H. Wilmerding, E. M. Izard, G. C. Bailey, W. G. Halm, C. M. Barclay, F. G. Beach and C. H. Wilson.

A sub-committee, Wilmerding and Sunny, will look after the comfort of distinguished guests, and another whose duty it will be to attend to the proper seating of ladies and gentlemen comprises Messrs. Beach, Izard and McKinlock.

H. C. Haskins, C. J. Hamlin, G. M. Smith, W. G. Halm, C. E. Stockwell and Wm. Taylor form the introduction committee.

F. E. Degenhardt, Fred. DeLand, Will. A. Stiles, George Cutter and W. Hillack will look after the music.

J. Stedman, Will. J. Buckley, J. H. Ghoest, C. E. Gregory and Frank Butterworth will take proper steps to encourage dancing, and

A. H. Brown, A. H. Lewis, M. A. Knapp, W. B. Pearson and F. W Cushing will provide amusements of a miscellaneous character.

The invitation contains an inclosure, one clause of which should make everyone feel that it is his reception as much as anyone's, whatever may be his station: "Come in full dress or not, whichever pleases you best, as the affair will be entirely informal. But be sure and come."

They will all be there, and have a good time.

**An Electrical Sluiceway.**—William Sharpe, an electrician at Oakland, Cal., on Wednesday, undertook to open a wire which he supposed to be dead. The breath was not out of its body, as William discovered. He tapped a current of 20 amperes, at a pressure of 600 volts, and laid down. After resting a few moments he got up, and declared he felt no evil results from being made a conductor of.

**Phrenomemotelegraph.**—An anecdote is going the rounds, of a Western merchant who couldn't remember an important visitor's name. It wasn't in his hat, and it wasn't on the pen wiper handle to his shirt front, and the situation was becoming embarrassing. The Western man finally excused himself, saying he must send a telegram he was near forgetting. It read: "What is the name of Jenkins' head man. Is here. Can't recall it."

Half an hour of embarassment, and it came: "Simpkins."

"By the way, Simpkins," said the relieved party, "let's go and lunch," and Simpkins knows nothing more than the lad who did the messenger work between David and Jonathan so long ago.

**Real Estate and Banking.**—The Edison Company here has made a loan on its property, 180 and 182 Monroe street, of $100,000 for a term of five years. When the property was purchased the company gave a trust deed for that amount, and when this became due the company, although abundantly able to do otherwise, chose to pay the note in this way rather than meet it with cash. The interest rate on the loan is five per cent.

**Leaf by Leaf.**—The Cushman Telephone Company has been perpetually enjoined in the case of the American Bell and the Central Union Telephone Companies against the Cushman and Service Telephone Company, D. C. Boley, C. A. Plautz, C. S. Owen, G. R. Davis and others. By an agreement between the parties the defendants consented to a clause in the order commanding them to deliver all the infringing instruments to the Clerk of the Court to be by him turned over to the complainants, and the complainants waived all but nominal damages. Frank Knight can have another bonfire now. How that man is cultivating his organ of destructiveness.

**Storms.**—The west is full of storm centers, and hardly a day passes but a death by lightning occurs. Dakota has been doing a very general electrical execution business. On the 19th, at a point about seven miles west of Sturgis, Dakota, Mr. Laysler, a young man, was killed; the house took fire and burned completely. A child was severely shocked at the same time, but will recover. A residence was struck and badly damaged at Sturgis, while a mile and one half distant a school house was badly wrecked by a discharge from heaven's battery. Almost no end of cattle were killed, and the money loss will reach thousands of dollars.

Northern Kansas, too, had a touch of the same storm, accompanied by high winds which prostrated light frame buildings, washed out culverts and carried off some bridges. Small grain crops were injured, but no lives were lost.

West Virginia caught it the same day, and the storm is put down in the minds of the future "oldest inhabitant" as the fiercest and most destructive to life and property ever known in that locality—the Little Kanawha Valley. A cloud-burst made it interesting for people who had heard about Johnstown. The valley of Pond Creek filled from hill to hill, and carried everything before it. Many perished in the flood.

**Monkey Work.**—A gentleman on Lasalle street has a constant potential motor running a fan in his office. One of those lightning letter carriers called messengers came in with a note, and while my informant was reading the note, the blue monkey with red trimmings caught sight of the motor. He put a finger on one brush. It didn't hurt, and he found that by pressing down on the tail of the brush, he made it spark. Then he took hold of both brushes and made it spark in two places, which ended the show, all but the applause, which the monkey, like Blind Tom, gave himself. The shaking up did him good, and the fingers will get well, but his memory was not injured in the least. He is no longer near-sighted, and don't care whether the "dolgoned" thing sparks or not.

**Multum in Parvo.**—That's what the schoolmarm found in Johnny's pocket, and reminds me that the Central Electric Company, at 42 Lasalle street, has just issued one of the most complete catalogues of everything in the line of electrical appliances, materials, tools, etc., that I have ever seen. Three hundred and thirty-six pages of octavo matter, with valuable tables and formula, and interspersed with over 1,000 fine illustrations, make a perfect electrical picture book of it; and the patron who doesn't see what he wants in that aggregation, might about as well make his will and stop breathing—for it's there if it is anywhere.

**Okonite.**—By the way, in the past week, Will. McKinlock told me he has sold over half a million feet of okonite, and that undertaker's wire is a drug in the market, except very, very far back, and away from healthy civilization, where the turnpikes are corduroy and the people burn corn and hay for fuel. C. C. H.

Chicago, July 27, 1889.

### OUR BOSTON LETTER.

**Meeting of the West End Company.**—One of the most important meetings in the history of the West End Street Railway stockholders was held Thursday to consider and act upon the proposition of authorizing the directors to petition the board of railroad commissioners for leave to increase the capital stock by the amount of $4,500,000 to be used in further introducing and perfecting the electric system of motive power. President Whitney made an able address explanatory of the plans and aims of the management, and the following motion of Mr. Henry D. Hyde, counsel for the company, was unanimously carried: "That the directors be and they are hereby authorized to petition the board of railroad commisioners for leave to increase the capital stock of the company beyond its present authorized capital stock by the amount of $4,500,000, divided into 90,000 shares of common stock, such increase being proposed to enable the company to pay for construction and increase of property, and in particular for expenses incurred and hereafter necessary to be incurred in introducing and perfecting the electric system of motive power in the operation of the cars of the company, such new shares to be issued from time to time by the directors, as provided by law."

**Still More Additions.**—The Thomson-Houston supply department has been transferred to the top floor of the Hathaway building where the additional space required is obtained and the engineering department will enjoy increased facilities in the old quarters of the supply department on the second floor.

**Electric Lighting in Lynn.**—An important meeting of the Lynn committee on fuel and street lights was held Thursday. Representatives of the Lynn gas and electric companies were present, and a new contract, to be presented at the next meeting of the board of aldermen, was agreed upon. By the new contract it is proposed to substitute 800 incandescent electric lights for the 625 gas and oil street lamps now in use. Seventeen new arc lamps will also be added. The incandescent lights will be furnished for $15 each annually and the arc lights for 40 cents a day.

**Various Convention Routes.**—The Boston contingent attending the Niagara Falls Convention seems destined to arrive by devious routes. One party, which it is said will reach good proportions, will leave Monday morning under supervision of Dr. Austin, going via St. Albans, Vt., and the Central Vermont railroad, and returning through the Thousand Isles and the St. Lawrence river. The regular party leave Monday afternoon via the Fitchburg railroad and Hoosac Tunnel. Col. C. M. Ransom, who has had the arrangements for the latter trip in hand, on Friday issued the following letter to those intending going to the convention: "If you, or parties going with you from Boston to Niagara, leaving Fitchburg depot at 3 P. M. Monday, August 5th, to attend the semi-annual Convention of the N. E. L. A., desire to return via Lewiston, Toronto, Lake Ontario, Thousand Islands and Montreal, thence by rail to Boston, you can obtain through tickets for the entire trip for $29.50, in addition to cost of sleeping car, by applying to the undersigned."

**Brief Mention.**—Mr. O. S. Hussey, formerly at the Edison Laboratory and latterly with the New Jersey and Pennsylvania Iron Company, using the Edison magnetic separator, has become connected with the Thomson-Houston Motor Company, with headquarters at the home office.—Mr. C. E. Bibber is representing the Holtzer and Cabot Company at the St. Johns exposition, where the company has a fine exhibit.—Mr. H. B. Cram, treasurer of the Bernstein Company, and very active in the management of the Electric Exchange, will be on hand at Niagara, and intends to take along a few Bernstein series lamps, etc., for a small exhibit.—Mr. Frank Ridlon expects to take his usual active part in the doings of the next convention.—Mr. L. W. Burnham, the popular manager of the Electric Gas Lighting Company, has gone to St Johns, N. B., to visit the exposition and incidentally widen out the circle of his friends and customers in that down east region. Any exhibit taken along will bear all comparisons.—Mr. F. E. Pettingell, accompanied by his wife and family, will leave for Niagara Falls a week from to-day. A few of the specialties handled by Pettingell, Andrews & Co., will be shown in private rooms.—Mr. Alex. P. Wright, managing director of the electrical engineering company which bears his name, will attend the convention, and is sure to make his presence felt in the discussions and deliberations of the sessions.—Dr. Mason, of the Simplex Company, is out of the city on a business trip, but will return in time to start for the convention, and Mr. Pond, who is now devoting all his time and energies to the Simplex interests, will also go, accompanied by his wife.

**The Evans Friction Coupling.**—I had the pleasure Thursday of visiting the Chestnut Hill pumping station in company with Messrs. Bowditch and Fahey, of the Boston Electric Light Company. The party was in charge of Mr. H. J. Conant, of the Evans Friction Cone and Pulley Company, and Supt. Dunn, of the station, exerted himself to the utmost to show his appreciation of the friction wheel, which does away with all belting between engine and dynamo. The compactness of this plant has already been mentioned in these columns, and Mr. Dunn is enthusiastic over its working and also over the results obtained from his "Standard" dynamo. T. W. S.

Boston, July 29, 1889.

### OUR TORONTO LETTER.

Since my last letter many interesting things have happened, and most important is that of the rehearing of the Edison case, a decision of which case was reported by you early in the spring. Then the case was heard before the commissioner of patents. The Edison Company take exceptions to his ruling, claiming he has no jurisdiction in such cases. It has been decided by the Government to rehear the case before the Commissioner of Agriculture. The evidence as submitted in the previous hearing is to be accepted in this one, as well as the arguments, allowing the counsel, however, an opportunity of amplifying their previous arguments. The Edison counsel attempted to quash the Canadian Patents Act through the medium of the International Convention for the protection of industrial property, assented to at Paris in 1883, by the contracting parties, Belgium, France, Brazil, Spain, and other countries. The counsel for the Sawyer-Man interests showed, however, that the obligations of the convention were discretionary with the British Provinces, thus upsetting that plea. The case was taken under consideration, allowing the Edison Company the privilege of filing a *factum*, and the Sawyer-Man counsel time to reply.

The city of Hamilton has been very much disturbed over the municipal lighting question. Tenders were recently asked for, and the gas company's tender was found to be the lowest. The board of works recommended its acceptance and that started an agitation cry of monopoly and it would kill the electric light company. Nothing has as yet been done and quiet will probably reign again, in that usually quiet suburb.

Toronto will make an addition of about 200 lamps during the summer to its municipal lighting, while the Edison Company are pushing matters in connection with their new station. They hope to be in operation this fall.

The Bell Telephone Company commence to-morrow to lay their underground system. They will terminate the conduits on their new building site on Temperance street.

The Federal Telephone Company, the lively competitor of the Bell Company at Montreal, were unfortunate enough to have their exchange burned out recently. It is supposed the fire was caused by an electric light wire becoming crossed with their system. They use the Law metallic circuit. It is very unfortunate for them as they were only just under way.

Col. Gzoueski, a civil engineer, has under consideration a plan for utilizing Niagara Falls as a source of power. The proposition is to erect a power station on the Canadian side renting grounds from the Government at $30,000 per year, and to export to the states what little current there may be over, after supplying the wants of Toronto and such suburbs as Hamilton, Brantford and small towns on the way.

The Canadian Government has been asked to guarantee the bonds of the proposed Atlantic cable. The total cost of the cable is placed at $1,750,000. $350,000 of this has already been taken by English capitalists and the balance it is proposed to raise at home. The cable will be but 1,900 miles long, extending from Westport, Ireland, to to Greenley Islands in the Gulf of St. Lawrence. It is more than probable the cable will be completed. Canadians are very jealous of American progress and are determined to show the "blarsted Yankee" they can progress also.

I have just learned that the contract for lighting Hamilton has been relet to the Local Electric Light Company. "CANADIEN."

Toronto, July 25, 1889.

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Major M. L. Stern, at the head of the Consolidated Electric Company, of Denver, Col., was a New York visitor last week, and will probably remain over for the Electric Light Convention.

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Fred. H. Whipple, general manager of the St. Louis Universal Electrical Exposition, is about the busiest man in the electrical field. He spent last week in N. Y., and is away in the West again looking after the welfare of the coming show, which he declares will be the most gigantic thing of the kind ever attempted in America. The novelties and inventions, new to the public, that he has secured and will favor the public with a sight of, will no doubt attract crowds to the Exposition who would not go to ordinary shows. Playing musical instruments of all kinds, including pianos and organs, cooking and heating, will be ordinary every day work of the machines now ready to go on exhibition. A complete street railway in operation will also be a feature of the exhibit.

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Judge R. S. Taylor, the attorney of the Ft. Wayne Jenney Electric Light Company, is one of the best informed attorneys on electrical matters in this country. In a recent newspaper interview he is reported as follows:

"As a disinterested party, Judge, would you like to express an opinion as to the consolidation of the Edison and Westinghouse companies?"

"I believe that consolidation will be brought about, although I do not think that there are any immediate prospects. These men have to fight each other very thoroughly at first, and when they get tired of that, then they will shake hands and work in harmony. But it will have to come, and my belief is that the entire electric interests of this country will eventually form a combination. They have to do it, and here is a good reason: The amount of money which is spent annually by these companies in litigation is an enormous item of expense, and the mere saving of that would make a consolidation advisable. On the other hand, the wrangling and fighting which now exists between all these concerns is disastrous to all of them, and the competition decreases profit very considerably."

"But would such a consolidation not be disadvantageous to the public?"

"No, not in this case. The elements of the electric business are common property, and a combination of all the electric companies in the world would not be able to monopolize them. Then, again, the construction of electric machines is now known by almost every ordinary machinist. For these reasons wisdom would prompt the large concerns to keep the price of their manufactures low in order to prevent a number of little fellows from getting into the market."

# Telephone News

*** The Westchester Telephone Company have greatly improved their Westchester Exchange by putting therein a long-distance telephone.

*** The phonograph has been employed in diplomatic correspondence. The Italian charge d'affaires in London sent a letter to Signor Crispi upon a phonograph cylinder.

*** A new telephone line is being built from Denver, Colo., to Boulder. The men at work who are putting up the wire have reached Semper, about 22 miles from Boulder.

*** The Rocky Mountain Bell Telephone Company, Salt Lake City, is suing the electric railway company of that city, claiming that the strong currents greatly interfere with telephoning.

*** Prof. Leucien J. Blake and an assistant are conducting scientific experiments at Tiverton, Mass., with a view to perfecting a system of telephonic communications between vessels at sea. The Professor claims to have succeeded in getting signals transmitted through the water at a distance of two miles.

*** The following is a statement of business of the New England Telephone and Telegraph Company for the quarter ending June 30, 1889: Gross receipts for three months ending June 30, 1889, $324,707.20; expenses for three months ending June 30, 1889, $230,893.20; net earnings for three months ending June 30, 1889, $93,814; construction for three months ending June 30, 1889, $17,923.98.

*** The American Telephone & Telegraph Company has issued a very neat little pocket-book on which is embossed one of their "blue bells"—a trade mark that is becoming quite generally known. Each pocket-book contains a small diagram map of the company's system. These little souvenirs will be very acceptable everywhere.

*** The local telephone service is certainly better than it has been at any time since the organization of the Cleveland Company, and as good as in any city in the country. Supt. McKinstry says that every effort is being made to accommodate the 2,400 subscribers of the company in the best manner possible. It is not generally known—and probably the managers of the exchange are pleased to have it so—that the operators at the exchange are always informed regarding the base ball score and always ready to answer questions regarding it. They keep up with the game from inning to inning, and most of them being interested themselves are agreeable in answering all demands on their information so far. Such is the policy of the exchange. When the new exchange system was put into operation a short time ago it became necessary for subscribers to call for numbers and not names in all cases. A couple of operators were accordingly delegated to the centre of the exchange to help out such of the subscribers as were unable to learn the number of a party wanted through the telephone directory. Very often it was not inability to find the number that caused the applicant to ask by name, but in every case the system of calling a second operator and returning to the first one had to be followed and is still. Now there are not more than 75 or 80 applications of this kind a day.

## Long Distance Telephoning.

Although the work of long distance telephoning and the results accomplished by it have been written up in this and other public journals from time to time, probably very few of our readers are aware of the present extent of the system. We print today a map of the system of lines of the American Telephone and Telegraph Company, better known as the Long Distance Telephone lines. All are now in operation, excepting the extension between Philadelphia and Washington, which will be completed in a very few weeks. Thus the territory embraced between Buffalo, Boston and Washington is within speaking distance.

The adjuncts to the long distance telephone lines which have been extended by local telephone companies throughout the East, bring their local territories also into direct connection with the long distance circuits. In hundreds of the cities and towns of the East, therefore, the well-known sign of the long distance telephone blue bell, indicates to the public that at the station so designated a direct conversation may be had with any desired party within the limits named above.

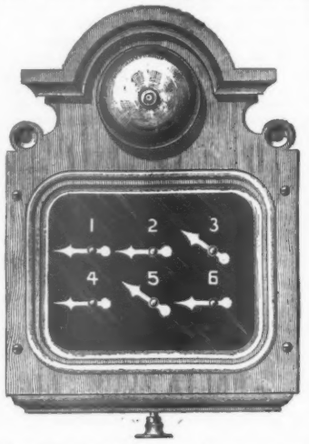
When it is considered that probably over three-fourths of the travel in the eastern part of this country is on business trips and that in nearly all cases the object of the trip is that two or more parties may talk together, and that this personal interviewing may now be carried on without the travel or loss of time, the immense opportunities afforded by the long distance telephone will be seen.

Accommodation has been afforded the public by the new rule in telephoning, which has been adopted by the Long Distance Company, under which a party may be called for and an interview arranged for without expense, the only charge being for the message during the time the actual conversation is carried on. Thus an appointment may be made at any desired hour with a distant party to be on hand at the long distance telephone office.

Although the system of long distance telephoning is comparatively new it is gratifying to note that there is an active demand for its use by the business public. It is well known there is a large manufacturing territory tributary to New York and Boston. It is now appreciated by corporations having offices in New York and Boston, with manufactories elsewhere, that the greatest service is rendered in their business by the long distance telephone. Indeed many of these manufacturers find it difficult to explain how they ever did without it.

An inspection of the extensions of lines recently made by the Long Distance Company shows that they are adhering to the high standard at first adopted and are improving constantly on the original specifications. Therefore their wires have a permanency which perhaps has not been attained by any other company in its plant. Ninety wires now lead east from New York on two distinct routes. Junction points are arranged on the through lines, so that in event of interruption on any one line temporary connections may be made by the other.

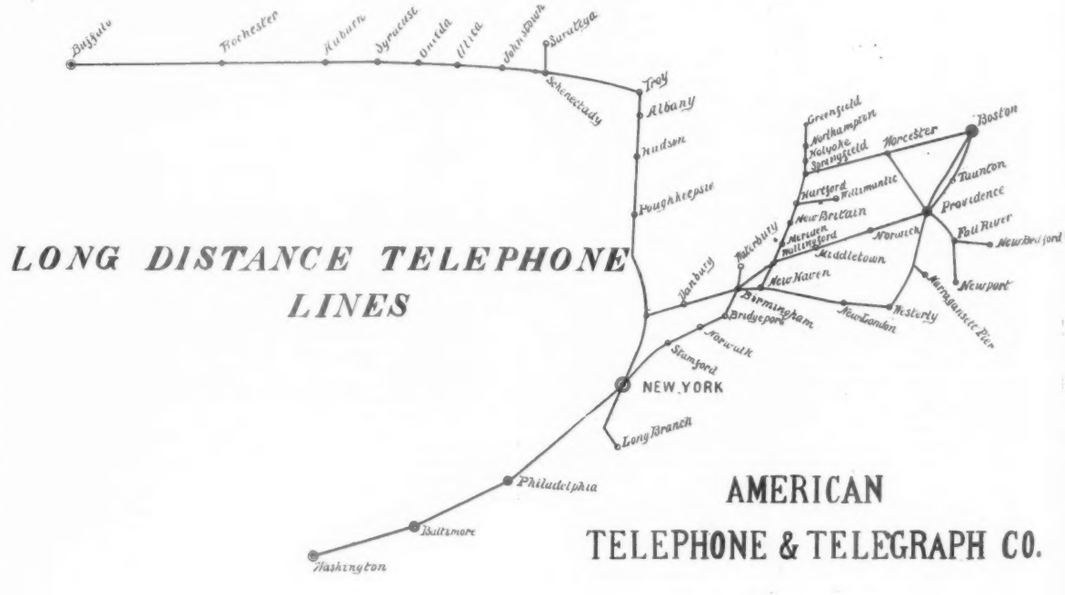
Lines not indicated on the published map are now under way, extending directly from New York and Philadelphia to the coal regions in Pennsylvania, from which there has been a large demand for the service.



New Western Electric Annunciator.

Convenient public pay stations are now located in the various cities reached, providing for the accommodation of the public. Indeed the business of long distance interviews is increasing to such an extent that the system is well called the most modern and effective means of intercommunication.

*** The general manager of the Mexican Telephone Company says the company has never been in as good condition before. Earnings are increasing and they are on the eve of a final decision maintaining their privileges and giving heavy damages.




*** The New England Telegraph and Telephone Company, at Lowell, Mass., have completed laying pipes through Market street, from Central and Dutton, for the underground system, and have commenced to tear up Central street, going towards Middlesex for the continuation of the work. Double pipes are laid three tier deep, at a depth of two feet underground, with manholes at regular intervals.

## The Western Electric Company's New Annunciator.

We have seen a new annunciator just being introduced by the Western Electric Company, which we are told they are selling at very low prices. Unlike the usual low price annunciator the wooden case is well made and of pleasing design, and the mechanism is simple and substantially put together. Since the competition in this kind of supplies has become so active there have been annunciators introduced which bear the appearance of having been made by the mile and sawed off to order with alleged ornamentation. This annunciator, of the Western Electric Company's, seems to have been made cheaply in another way; that is, by leaving off all superfluous parts and by introducing improved methods of manufacture which save in labor without detracting from efficiency; and it seems as though such a piece of apparatus would prove a great boon to that army of electrical workers who are devoting their energies to introducing electricity in house service.

## "Telepheme" Suggested as the Word for a Telephone Message.

To the Editor of Electrical Review.

I have received a note from Prof. James D. Dana, of Yale University, in this city, which contains a suggestion that I think of interest to the telephone world. Prof. Dana says: "It has often occurred to me that there ought to be a word for a telephone message, just as telegram is used for telegraph message. I write to suggest that an appropriate word would be *telepheme*, the latter part from the Greek φημι, one of whose meanings is a speech or a saying; or from ψημι, I speak."

I think that the appropriateness of the term is evident to all who are familiar with the manner in which such words are formed.

I am, yours very truly,

Morris F. Tyler.

New Haven, Conn., July 23.

## Hypnotizing by Telephone.

Dr. Pinel, of Paris, is said to have succeeded in hypnotizing several subjects by means of the telephone. All the commands given through this channel were, he declares, as readily obeyed as those which he uttered directly, and suggestions of every possible sort were as effectually communicated through the medium of the machine as if made *viva voce*. The conclusion which he deduces from his experiments is that the received theory of a magnetic current passing from the operator to the subject is entirely baseless, and that the real cause of the phenomena of hypnotism is nervous derangement on the part of those subject to them.

## The Telephone Exhibit at the Paris Exposition.

The very excellent sketch, made by the REVIEW'S artist, presents the interesting and attractive exhibit made jointly by the American Bell Telephone Company and the Western Electric Company, of the United States, at the Paris Exposition. The location is the best in the entire section, and being located at the entrance and fronting on the main aisle is open to view from two sides as shown in the illustration. The display, as before mentioned in these columns, consists of telephone instruments, switchboards, cabinet sets for long distance talking, and samples of the multitudinous electrical goods manufactured by the Western Electric Company. A number of prominent exhibitors, the office of the U. S. Commission, the Exposition post office and other leading places have been connected through long distance telephone sets with a local exchange in the center of the telephone exhibit and placed in charge of a young lady operator who is supposed to be such an accomplished linguist that whether she is called up in English, French, German, Japanese, Spanish, or any other language, she can respond appropriately, and thus prove the wonderful comprehensiveness of the telephone. A large painting of Prof. Bell hangs on the wall at the back of the exhibit, the walls generally being adorned with interesting pictures of the different telephone exchanges of this country. Above the picture of Prof. Bell appears a statement in French of the extent of the telephone business of the United States, the number of messages sent over the telephone every year, miles of wire, etc. Rising from the center, its base surrounded with a number of beautiful foliage plants and potted flowers, is the top half of one of the 80 foot poles of the American Telephone and Telegraph Company (long distance), a sample of the admirable line construction of that company in the United States. The pole was found to be very useful, too, as by means of it the wires to the switchboard beneath were all brought in from the different telephones.

The majority of our telephone readers are acquainted with Mr. W. D. Sargent, the able and popular gentleman in charge of this exhibit. Life in sunny France has agreed with Mr. Sargent, who left here four months ago in poor health, and even his best friends may have difficulty in recognizing him on his return to New York this week.

(*Continued on page 8.*)

VIEW OF THE FINE EXHIBIT OF THE AMERICAN BELL TELEPHONE COMPANY, AND OF THE WESTERN ELECTRIC COMPANY, AT THE EXPOSITION UNIVERSELLE, PARIS.

* * The arms for holding the electric wire for running the street cars between Adams and North Adams, Mass., are being put in place, and the wires will be strung next week.

* * If the present plans are carried out—and they probably will be—East Saginaw, Mich., will soon have extensive electric street railway systems—every car being moved by that power.

* * In the patent suit of A. L. Ide & Son against the Ball Engine Company of Erie, Penn., for infringement of use of dash pot in fly wheel governor, Judge Blodgett of Chicago, on July 22d, handed down his opinion in favor of the Ball Engine Company.

## THE TELEPHONE EXHIBIT AT PARIS.

(*Continued from page 7.*)

An excellent idea of his improved appearance may be obtained from the picture which represents him standing in the foreground. Just what connection there may be between the bouquet on his desk and the pretty young lady in front, our artist fails to state, but since it was discovered that our handsome American is a bachelor, his desk has not been without a fresh bouquet every morning.

This exhibit is one of the best and most interesting in the U. S. section and reflects credit on the two enterprising companies that sent it there, as well as on the gentleman in charge.

Mr. J. D. Bishop, of the Western Electric Company, and Mr Stone, of Washington, son of the late Gen. Stone, are with Mr. Sargent, both gentlemen speaking the French language fluently. Mr. Bishop was the first arrival and had the task of superintending the installation of the exhibit, a work of no small difficulty.

* * C. T. Church is construction engineer of the Saratoga and Geyersville Railway, N. Y.; E. O. Britton, of Lebanon Springs, will have charge of the grading and brick laying; Riley Clothier will furnish the poles, and the Thomson-Houston company will string the wires and furnish the electric current.

* * The new electrical road in Toledo, O., of the Thomson-Houston system, was finished lately. It is over three miles long and runs to the new factory of the Schaefer Electric Supply Company, now building at a cost of $10,000, to be ready for occupation by the middle of September, with a capacity of 200 hands. Another electrical road, 21 miles long, will be built this year.

* * The Thomson-Houston Electric Co. have recently closed new contracts with the following street railways: Passaic Street Railway, Passaic, N. J., three miles, three cars; St. Louis Bridge Co., St. Louis, Mo., two miles, four cars; Ottumwa Street Railway Co., Ottumwa, O., five miles, four cars; Georgetown, Tenalley Town Street Railway Company, Washington, D.C., three miles, six cars; Victoria Electric Street Railway Co., Vancouver Island, Victoria, B. C., four miles, four cars; Saratoga Electric Railway Company, Saratoga Springs, N. Y., two miles, four cars.

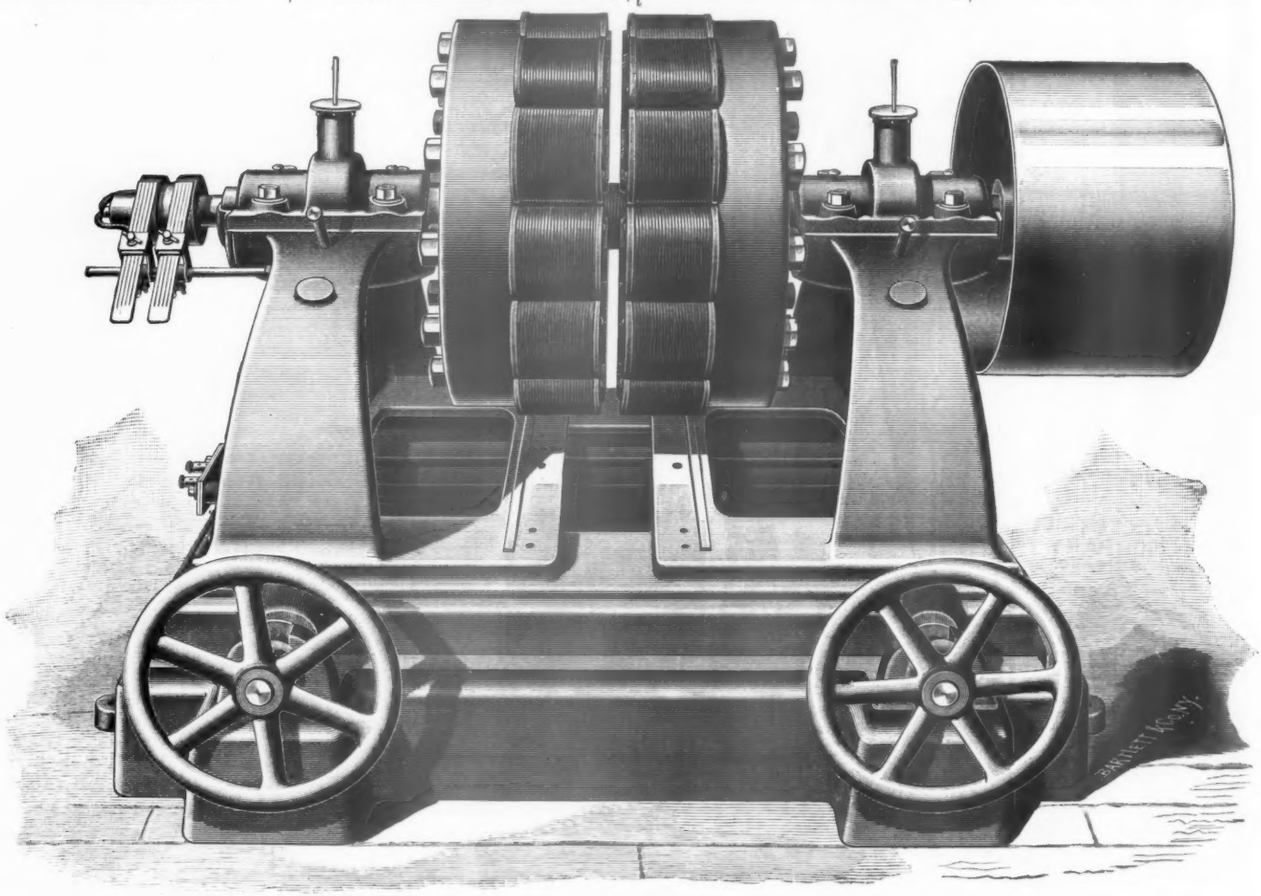
### The Brush Alternating Dynamo.

We present another view of the improved dynamo of the Brush Electric Company representing the generator with armature removed. The artist has made a most excellent picture of this handsome machine, one that brings out its many excellent points in a strong manner. This evidence of keeping up with the times on the part of the ever reliable Brush Company will be hailed with pleasure by its many thousand patrons. Mr. Brush never does things by halves, and his alternating system will undoubtedly at once take its merited position in the first ranks of electrical improvement.

### The St. Louis Electrical Exhibition.

Mr. Fred. H. Whipple, manager of the Exhibit, which begins September 4th, has been energetically at work securing exhibitors, and is able to name the following very extensive list:

American Electric Register Co., Boston, Mass.; American Electric Motor Co., New York; American Waltham Watch Co., Boston, Mass.; American Silk Manufacturing Co., St. Louis, Mo.; American Watch Tool Co., Waltham, Mass.; Akron Rubber Co., Akron, Ohio; American Tool and Machine Co., Boston, Mass.; Automatic Switch Co., Baltimore, Md.; Aeolian Organ and Music Co., New York; Butler Hard Rubber Co., New York; Burton Electric Co., Richmond, Va.; Bishop Gutta-Percha Co., New York; Bundy, W. L., Auburn, N. Y.; Buckeye Engine Co., Salem, Ohio; Boston Electric Co., Boston, Mass.; Ball Engine Co., Erie, Pa.; Bernstein Electric Co., Boston, Mass.; Bunnell, J. H. & Co., New York; Cleveland Electrical Mfg. Co., Cleveland, Ohio; C. & C. Motor Co., New York; Cincinnati Electric Engine Co., Cincinnati, Ohio; Cole Conduit Co., Detroit, Mich.; Central Electric Co., Chicago, Ill.; Connor, Thomas J., St. Louis, Mo.; Clark Bros., Belmont, N.Y.; Detroit Motor Co., Detroit, Mich.; Detroit Lubricator Company, Detroit, Mich.; Elektron Manufacturing Co., Brooklyn, N. Y.; Electrical Accumulator Co., New York; Electro Dynamic Co., Philadelphia, Pa.; Eastern Electric Cable Co., Boston, Mass.; Easton Electric Co., New York; Edison, Thomas A., Orange, N. J.; Electric Construction & Supply Co., New York; Eureka Electric Co., New York; Eureka Belting Co., New York; Elgin Telegraph & Telephone Co., Elgin, Ill.; Findlay Glass & Carbon Co., St. Louis, Mo.; Freeman Dynamo and Motor Co., New York; Fuller, Seth W., Boston, Mass.; Holmes, C. H. & Co., St. Louis, Mo.; Heisler Electric Light & Power Co., St. Louis, Mo.; Hill Clutch Works, Cleveland, Ohio; Illinois Angle American Storage Battery Co., Chicago, Ill.; Jeffery & Co., Columbus, Ohio; Janney & Wickersham, Pottstown, Pa.; Jaques Phonograph Toy Co., Boston, Mass.; Kester Electric Co., Terre Haute, Ind.; Liberattie's Electric Drum Corps, New York; McCreary, A. A., New York; Morris Tasker & Co., Philadelphia Pa.; Missouri Electric Light & Power Co., St. Louis, Mo.; Missouri Phonograph Co., Kansas City, Mo.; Municipal Signal Co., Boston, Mass.; Monarch Alarm Co., Baltimore, Md.; Mitchell & Vance Co., New York; National Telephone Co., Boston, Mass.; Noye, John T., Mfg. Co., Buffalo, N. Y.; National Carbon Co., Cleveland, Ohio; Noble, James, St. Louis, Mo.; New York Insulated Wire Co., New York; Non-Magnetic Watch Co., New York; Oxley, Giddings & Enos, New York; Perkins Lamp Co., Hartford, Ct.; Parrish Bros. & Peck, Detroit, Mich.; Porter Electric Co., St. Louis, Mo.; Pond Engineering Co., St. Louis, Mo.; Pittsburgh Electric Co., Pittsburgh, Pa.; Powell, Wm., Co., Cincinnati, Ohio; Paca, Wm., Baltimore, Md.; Phoenix Glass Co., Pittsburgh, Pa.; Reliance Gauge Co., Cleveland, Ohio; Robinson-Foster Electric Motor Co., Boston, Mass.; Simplex Electrical Co., Boston, Mass.; Sperry Electric Co., Chicago, Ill.; St. Louis Battery Mfg. Co., St. Louis, Mo.; Sperry Electric Mining Machine Co., Chicago, Ill.; Standard Paint Co., New York, N. Y.; Storey Electric Mining Machine Co., Denver, Colo.; Sprague Electric Railway and Motor Co., New York; Schuyler Electric Co., Middleton, Ct.; Schieren, Charles A. & Co., New York; Stilwell & Bierce, Dayton, Ohio; Stephenson Co., John, New York; Silvey Electric Co., Lima, Ohio; Stout, Mills & Temple, Dayton, Ohio; St. Louis Electrical Co., St. Louis, Mo.; Smith, J. G., St. Louis; Southern Electric Co., St. Louis; Schultz Belting Co., St. Louis; Seigel, A., St. Louis, Mo.; Taylor Manufacturing Co., Chambersburg, Pa.; Tatham & Bros., Philadelphia, Pa.; Union Electric Car Co., Boston, Mass.; Viaduct Mfg. Co., Baltimore, Md.; Western Electric Co., Chicago, Ill.; Warren, Webster & Co., Philadelphia, Pa.; Walker, Geo. W., New York; White, R.T., Boston, Mass.; Writing Telegraph Co., New York, N. Y.; Wainwright Mfg. Co., Boston, Mass.; Ziegler Bros., Boston, Mass.



THE BRUSH ALTERNATING CURRENT DYNAMO.—VIEW WITH ARMATURE REMOVED.

* * The Thomson-Houston Company has just closed a large contract to equip its second electrical road in Washington, D. C., and parties having the exclusive right to run an electric road over the great St. Louis bridge have also contracted with this company for electrical equipment.

* * The new buildings of the Western Pennsylvania Exposition Society, Pittsburgh, are now almost finished. The society has awarded the contract for the power to drive machinery in Mechanical Hall to the Westinghouse Machine Co., the engine being one of their new compound type of 250 h. p.

* * The modern plan of subdividing steam power; in other words, the primary transmission of power from the boiler to the work by means of steam pipes in place of belts and shafting, is rapidly growing in favor. Westinghouse, Church, Kerr & Co. are leaders in this branch of engineering, and are now fitting up the plant of the Long Island Railroad at East New York, using in place of a single engine, three engines of 75, 60 and 25 h. p. respectively.

* * Every wheel at the 1892 Exposition should be made to turn by electric power.

### Electro-Motive Force of Amalgams.

Experiments on the E. M. F. of amalgams immersed in an electrolyte, such as zinc sulphate or dilute sulphuric acid have been made by Crova, in Germany; Gaugain, in France; and Hockin and Taylor in England. It was found that excessively small traces of zinc or cadmium made a marked difference in the E. M. F. of mercury. Thus an amalgam investigated by Hockin and Taylor, consisting of 1 part zinc to 23.6 million parts of mercury in sulphate of zinc, was discovered to be more positive than pure mercury by 0.01 volt, and an amalgam composed of 1 part cadmium in 5.7 million parts of mercury was shown to be more positive than pure mercury by 0.09 volt. A German scientist, Herr S. Lindeck, in a recent paper, describes a series of experiments that he has made on amalgams of zinc, cadmium, silver, lead, and tin. The results of this investigation are graphically exhibted by means of curves, in which the percentage of the metal alloyed with the mercury is plotted against the corresponding change in the difference of potential. Hockin and Taylor's results are confirmed, and by comparing these curves Lindeck infers the following conclusions: 1. The higher the position of a metal in the electro-motive series, the higher will the addition of a slight trace of it raise the position of mercury in the series. 2. A further addition of metal produces scarcely any effect; the amalgam containing a mere trace of the metal occupies practically the same position in the series as a bar of amalgamated metal. 3. In whatever proportions silver and mercury be amalgamated, the amalgam occupies approximately the same position in the series as that occupied by pure mercury.

### Slow Progress of Electric Lighting in Buda-Pesth.

Our London namesake says that "the travelled stranger, during a stay in the capital of Hungary, is involuntarily struck with the fact that in a city which presents otherwise so many attractions, and which has developed itself with such astonishing rapidity, the electric light is mainly conspicuous by its absence. Whilst in our days one city after another fits up electric works, or permits them to be established as private undertakings, whilst in the neighboring capital, Vienna, at this moment three large electric central stations are in course of erection, in Buda-Pesth not even the preparatory steps for establishing electrical works have been taken. Save in large industrial concerns, which can generate the electric light cheaply for themselves, the number of places lighted electrically is vanishingly small. Of all the theatres, the National Theatre is the only one which has electric lights at its disposal. Even the Royal Hungarian Court Opera House, a splendid monument of architectural skill, is lighted with gas.

"This phenomenon is the more remarkable, as Buda-Pesth is the seat of a firm which has done great things in electrotechnics, and which has become especially distinguished in lighting cities—a sphere in which it has rapidly obtained a high reputation in all parts of the world. In view of the enterprise, and the well-known patriotic character of this firm, the question is justified why the installation of electrical work is not carried out here so as to place the electric light within the reach of persons who are not in a position to fit up the necessary machinery in their own houses. The only cause for this generally-lamented state of things is the (probably unique) stipulation of the covenant with the local gas company, which concedes to the latter body the exclusive right to use the territories of the public squares, streets and roads for laying down conductors for any kind of lighting whatever."

—— The Clark Electric Company has moved its offices to the new Corbin Building, 192 Broadway, corner of John street. The location is a very desirable one. The arc lighting system of the Clark Company is familiar to our readers, having been recently described and illustrated. Mr. James H. Seymour is president, Mr. A. Bedell Benjamin, secretary, and Ernest P. Clark, electrician of the Company.

### Electric Motors for Organ Use.

Not least among the many uses which electricity now subserves is the adaptability through the medium of motors to the operating of church organs.

During the last two or three years various experiments were made to this and with uncertain success. It was through the perseverance and ingenuity of the "C. & C." Electric Motor Company, of New York, that real practical success was at length attained, and this company, as is only just, is now reaping the reward of its efforts. This company is especially well equipped for this work in the person of Mr. Wm. Chester, who is connected with it; he is himself an organist of high reputation, thoroughly familiar with the mechanism and construction of church organs as well as with the electrical power required for their operation. The "C. & C." Electric Motor Company have now placed their motors in St. Paul's Church, St. Patrick's Cathedral, the Collegiate Reformed Church and the Madison Square Church, and contracts have been signed for similar installations in Trinity, St. Thomas's, Calvary and St. Ignatius. This list represents the company's work in New York only, and from it will be seen that the "C. & C." Company have a practical monopoly of the organ work in that city. The first motor for this use was set up in the historical St. Paul's Chapel in Trinity Parish; the corporation of Trinity were skeptical and it was only after the work through tests that the motor was pronounced a success. Once, however, this was established the corporation instructed the company to make a similar installation, but of greater magnitude in Old Trinity, and in the mean time churches of all denominations had followed the example set by St. Paul's. The advantages of the motor over other means of pumping the bellows are so evident that it is only a question of a short time before all churches, within reach of electric current, will be provided with this appliance. Henceforth the organist is independent of the pleasure of the organ blower, or the vagaries of the gas engine; he seats himself at his instrument, touches a button within easy reach of his hand, the motor revolves, the bellows rise and fall, and the organ obedient to his touch gives forth its rich tones.

The "C. & C." Electric Motor Company were for some time known only as makers of small motors; their success in this direction, coupled with increasing demand for large motors and new facilities for their manufacture, induced them to turn their attention to this wider field; with what result may be inferred from the fact that during the last four months upwards of 100 horse-power in sizes ranging from one to 20 horse-power have been placed in New York City alone. In Chicago, Boston and the other important cities East and West, the results have been equally gratifying to the company and its well wishers.

—— It is probable that the Citizens Traction Company, of Pittsburgh, Pa., will build an electric road from its track at Pearl street to the Allegheny Cemetery, and through Bloomfield over to the line of the Fifth Avenue Company at Shadyside. The track will be one of the longest in the city.

—— Electricity has been brought into use as a motor for coal mining. A machine of the kind has been in practical operation every day at the mines of the Shawnee and Iron Point Coal Company, Shawnee, Ohio, since the 1st of May. It only requires 3¼ minutes to make a cut 5½ feet deep and three feet face. The cuts are made and the cutter bar withdrawn within four minutes, and the machine moved ready for another cut in less than 10 minutes. It does not require any effort on the part of the attendant while the machine is at work. At this rate, six cuts per hour, or 60 cuts per day of 10 hours, can be easily made, and the machine will undercut 200 tons of coal. This is the capacity of the first machine which is now in operation, it being the opinion of those able to judge that under favorable conditions 300 tons of coal could be undercut per day.

### The Dynamo as Viewed By a Poet.

[Written for the ELECTRICAL REVIEW.]

O, Dynamo!
Who can tell thy mighty power?
Who can say if thy chief aim
Shall be to light the universe,
Or rid the world of that unhappy class
Of human kind which goes by name
Of Murderer?

Who can say if thou canst claim
An E. M. F. of such degree
As shall be able, or to maim
Or bring to instantaneous death,
Thy victim?

Shalt thou aid, from depth below
The gentleman, to burn and scorch
All earthly sinners?
Or shall thy vast and untold strength
Be so directed that the human frame
A mummy shall become?

JOHNS HOPKINS UNIVERSITY,
July 25, 1889. F. C. SCHNEIDER.

—— The Safety Light and Power Company have commenced the erection of their extensive station in New York City. They will operate the Westinghouse alternating system, and have contracted for six Westinghouse Compound Engines, each of 150 horse-power.

—— The Elmira Electric Light Company, Elmira, N. Y., are putting up poles preparatory to erecting the lights ordered by the city. The power for working the light is being "planted" on the gas works property in the Seventh Ward. The lights will be ready in a couple of weeks.

—— At a meeting of the Atchison Electric Light and Power Company, Atchison, Kansas, it was decided to accept the proposition of the city council to substitute electric lights for the present gas lamps at $6 a month, on a five-year contract. The lights will burn until 12 o'clock, and they will number about 80.

—— A prize of $2,000 is offered by the municipal council of Paris to the inventor of an electric meter giving entire satisfaction, and five prizes of $400 each to the five inventors whose meters have given the most satisfaction. Should a meter only be suitable for measuring one kind of current only half the prize will be given.

—— The Llewellyn Park Association, Orange, N. J., is considering the question of introducing electric lights throughout the park, in connection with the extension of the Qrange electric light system into West Orange. At present there is no gas in the park. It is thought that the park can be thoroughly lighted with from twenty-eight to thirty 1,200 candle power lamps.

—— The Sawyer-Man Company shipped 93,000 lamps during the month of June from their factories in New York City. The daily capacity of the factory, which has just been fully equipped, is 5,000 lamps. The factory is equipped with boilers of 750 horse-power, five compound engines being employed, two of 200 horse-power, one of 125 horse-power, three of 25 horse-power, and a number of smaller engines for running the dynamos.

—— The workmen of the East End Electric Light Company, Pittsburgh, Pa., have broken ground to put up eight new arc light machines at the East End plant. These machines are generators of 50 lights each. The company expects to have the entire arc light plant in operation within a month, and all the electric lights in the city will then be operated from this one place, while at present they are partly being supplied by the Allegheny County Light Company.

—— The Milford Electric Light and Power Company, Woonsocket, R. I., at their last meeting, voted to discontinue running all night, as the income is not sufficient, there being only 15 all-night lights. After Aug. 1 the incandescent lights will shut down at 12 o'clock Saturday nights and at 11.30 P. M. on other nights. They will keep up 40 pounds of steam on the boiler with the fire banked and a man will stay there all night, so in case of fire the fire alarm whistle will blow as usual and the lights be turned on.

## ELECTRIC LIGHT NEWS

—— Darlington, S. C., will probably have electric light, the Mayor having the matter in charge.

—— N. D. Cole, Sr., of Newman, Ga., wants estimates for an electric light plant for the new cotton mills.

—— The Westinghouse and Thomson-Houston Companies have applied to locate an electric plant at Randolph, Mass.

—— It is estimated that it will cost Oakland, Cal., about $60,000 for the poles, masts, towers and wires for the proposed municipal electric light plant.

—— The Thomson-Houston Electric Light Company, of Meridian, Miss., will shortly enlarge their plant and solicit correspondence in regard to the machinery for that purpose

—— The Baltimore and Ohio Railroad Company, of Baltimore, will put an electric light plant into their shops at Grafton, W. Va., and will apply for a charter to light the town.

—— The Thomson-Houston Electric Light Company will build a one-story electric light plant at the southwest corner of 17th and Market streets, St. Louis, Mo., to cost $2,000.

—— Electrician W. W. Slater, of the Southern Pacific Company, Oakland, Cal., will ask the corporation to introduce a system of electric lighting on the Oakland local trains.

—— The Thomson-Houston Electric Lighting Company, at Amherst, Mass., has orders for 800 incandescent lights, including those in use, and the prospect is good for 2,000 lights soon.

—— The price for the Middleboro Electric Light and Power Company's, Middleboro, Mass., incandescent light has been placed at one cent per hour by meter, or 80 cents per lamp each month.

—— The Carlisle Gas and Water Co., Carlisle, Pa., have commenced work upon a new building at their electric light plant. It is intended for the accommodation of machinery necessary for a system of the incandescent.

—— The Plymouth monument, at Plymouth, Mass., will be illuminated by electricity Wednesday and Thursday evenings, and will be an imposing spectacle, with its white granite sculptures brought out in bold relief.

—— The Kennebec (Me.) Heat and Light Company are putting in an electric plant at the gas house, with which they intend to run the incandescent system in the city. It will also be large enough to run the street lights if required.

—— The Committe on Revision of the Constitution of the National Electric Light Association held several meetings at the headquarters of the Association in this city last week, and hope to be ready to report at the meeting next week.

—— The Easton Electric Light and Power Company, at Belfast, Maine, lately advertised for cedar poles for that city, and the only answer they got was from Saginaw, Mich. Their terms were accepted and the poles are expected at once.

—— The North Shore Electric Light Company, Boston, Mass., has increased its plant recently in order to supply power for the Revere Street Railway. The addition includes a 200 horse-power engine, also an electric generator of 200 horse power.

—— The city fathers of Omaha, Neb., are after more and better illumination in the city building. The incandescent electric lighting system is being put in, and hereafter the aldermen will conduct their deliberations under the brilliant rays of the electric current.

## KINDRED INTERESTS

**The Edson Recording Gauge.**—This valuable invention is becoming more and more popular with electric light companies and all who have used it in the past consider it indispensable. The advantage of having a complete record of the steam pressure night and day is a valuable feature that enterprising station managers are not slow to appreciate. Mr. Jarvis B. Edson, who has recently taken a long lease of a suite of offices at 87 Liberty street, N. Y., finds the demand so active that it is difficult to keep customers supplied. The gauge certainly deserves its popularity, for it is thoroughly reliable.

**Messrs. A. L. Ide & Son.**—These well-known engine builders, of Springfield, Ill., have been awarded the contract for two Ideal engines for driving an incandescent plant that is being installed in the Odd Fellows' Hall, St. Louis; also just installed two Ideal engines in B. Nugent & Bro's. new dry goods store, St. Louis, and received an order last week from the St. Louis *Republic* for an Ideal engine to light their building. Also just signed a contract with the St. Louis Bridge and Tunnel Company for a 90 horse-power Ideal engine to drive the generator for operating electric street cars on the bridge. Engine business is evidently good with the Messrs. Ide.

**The Westinghouse Machine Co.** seem to have solved the problem of medium and small-sized compound engines, in addition to the heavier horse-powers. This company is now manufacturing single-acting compound engines down to 35 h. p., and adding a line of patterns down to three h. p. Although turning out over 3,000 h. p. per month, they are constantly over sold, and are now running their works on double turn. To illustrate the adaptation of the compound engine to small powers, we would note one of their compound condensing engines of 45 h. p. on the dock of the Red Star Steamer Company at New York. This engine exhausts into a Korting condenser using salt water, and operates a storage battery plant.

**The Jarvis Engineering Co.,** Boston, Mass., have acquired an excellent reputation from their success in the erection of complete steam plants for electric lighting and other purposes. They have just received the contract from the city of Bangor, Me., for the steam plant for their electric system, and are now at work putting in for them two horizontal tubular boilers with special fittings, and setting them with their Jarvis patent furnace, and are to furnish them with an Armington & Sims engine of 150 horse-power capacity. They are also putting in two engines for the Edison Electric Illuminating Company, of Newport, R.I., aggregating 250 horse-power and doing the other work incidental to this increase in their plant.

**The Thomson-Houston Electric Company** reports the following long list of sales: Springfield, O., 1,300 inc.; Brunswick, Ga., 50 arc; Paterson, N. J., 650 inc.; Nantucket, Mass., 18 arc, 500 inc.; Lee, Mass., 650 inc.; Memphis, Tenn., 1,300 inc.; Palmer, Mass., 650 inc.; Eufaula, Ala., 50 arc; Great Falls, N. H., 200 arc; Portsmouth, N. H., 500 inc.; Catskill, N. Y., 650 inc., 30 arc; Natick, Mass., 1,300 inc.; Bellaire, O., 70 arc.; Athens, O., 50 arc; St. Joseph, Mo., 100 arc; Canandaigua, N. Y., 650 inc.; Citizens' Co., Brooklyn, N. Y., 135 arc; Chattanooga, Tenn., 100 arc; Montclair, N. J., 30 arc, 1,300 inc.; Baltimore, Md., 1,000 inc. And the following isolated plants: Julius Saul, Albany, N. Y., 20 arc, 100 inc.; Providence Steam Engine Co., Providence, R. I., 30 arc.; Spencer House, Niagara Falls, 200 inc.; Rodman Manufacturing Co., Lafayette, R. I., 800 inc.; Bennett Manufacturing Co., New Bedford, Mass., 800 inc.

**The Ball Engine Company, of Erie, Pa.,** manufacturers of the Ball automatic cut-off high speed engine, are making considerable additions to their capacity, adding both machinery and new buildings. Although the works have been running night as well as day for the past ten months back, the company have hardly been able to keep up with their orders, and the present increase is absolutely necessary.

It will give an idea of the demand for this celebrated engine when we mention that the company now have orders for 7,165 horse power of engines to build for electric light and electric railroad purposes.

The thorough manner in which the engines are built, their smooth running qualities, their handsome appearance, and their perfect regulation commends the Ball engine to all electric users.

In addition to their regular standard engines, they are bringing out a line of compound engines, both tandem and double horizontal, in capacity from 30 to 300 horse power.

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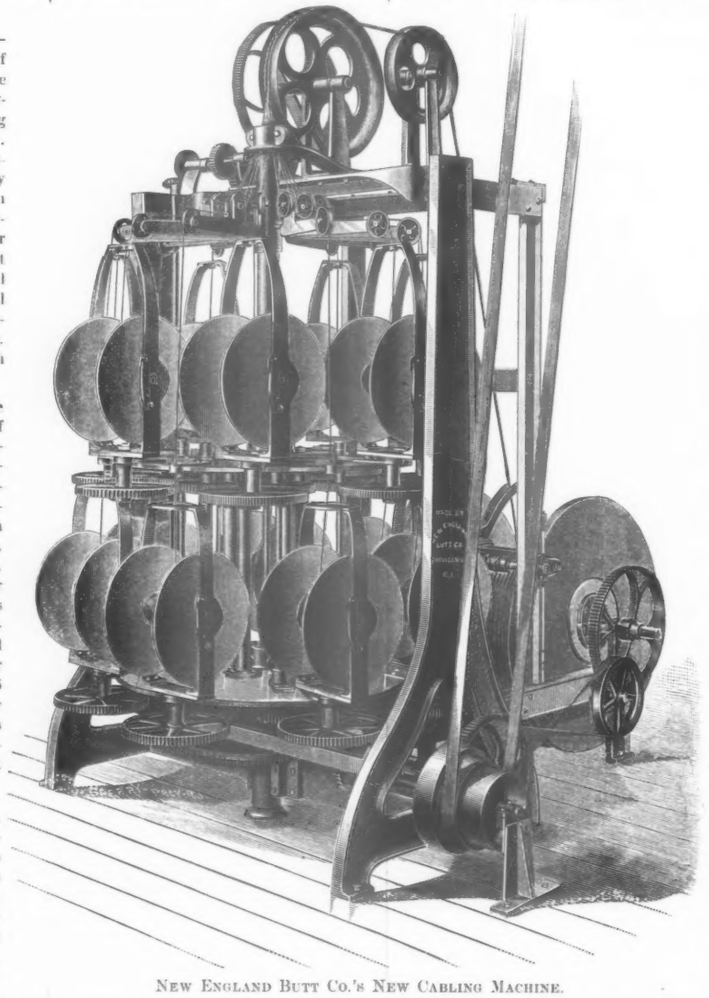
.... At the annual meeting of the stockholders of the Vermont & Boston Telegraph Company the following directors were chosen: Norvin Green, Thomas T. Eckert, C. A Tinker, R. H. Rochester, of New York; Thomas Roche and H. C. Sherman, of Boston; R. J. Kimball, of West Randolph, Vt.; G. W. Smith and H. E. Tinker, of White River Junction, Vt. The directors subsequently elected Norvin Green president; T. T. Eckert and C. A. Tinker, executive committee; R. H. Rochester, secretary and treasurer.

### The New 12-Strand Cabling Machine Made by the New England Butt Company, Providence, R. I.

In addition to the braiding and winding machinery for covering electrical wires, this company has recently brought out, among other special machinery, the above machine for cabling electrical wires. The machine is designed for cabling 6 to 12 wires around a center composed of other wires. The reels on each carrier are made of iron, 17 inch head, 9½ inch traverse, with 6 carriers to each disc, and a hollow centre spindle. The wire, after being cabled, passes from the feed wheel down to the drum at the back of the machine, which is 36 inch diameter of head, with 30 inch traverse, and is guided on uniformly by a traverse motion, variable according to the size of cable. The drum is easily replaced when full by simply lifting off the machine.

These machines are made in four sizes, three, four, six and twelve carriers; any less number of wires can be cabled by leaving off reels. The machine is driven by a three change cone pulley for a variation of speed to suit the different classes of work.



NEW ENGLAND BUTT CO.'S NEW CABLING MACHINE.

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.... The Commercial Union Telegraph Company, of Maine, has its poles erected as far as Brunswick. By the first of August, if nothing unforeseen prevents, the line will be in working order to Bath, Brunswick, Lewiston and Auburn. Mr. C. E. Arnold, of Albany, N. Y., the general manager of the Commercial Union, has been in Maine to inspect the operations, and expressed himself as much pleased with the progress made and the manner in which the work is being done.

**ENGINEERING DEPARTMENT, VANDERBILT—UNIVERSITY.**
Courses in Civil, Mechanical and Mining Engineering, and Manual Technology. 12 Professors, 10 Assistants, two buildings, extensive facilities, field-outfits, draughting-rooms, laboratories and shops. Tuition, $65 per annum. Free course in highway construction. For catalogue of this or Academic, Law, Medical, Biblical, Dental or Pharmaceutical Departments, address
WILS WILLIAMS, Bursar, NASHVILLE, TENN.

## ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JULY 23, 1889.

407,327 Electric generator; Charles E. Buell, Newark, N. J.

407,386 Bath or solution for separating metals from their ores; Jacob C. Wiswell, Medford, assignor, by direct and mesne assignments, to the Electric Gold and Silver Chlorination Company, Boston, Mass.

407,414 Electric meter; Wm. McKinney, Schuylkill Falls, Pa.

407,416 Station and want printer; Major D. Porter, Brooklyn, N. Y., assignor to the Porter Teletype Company, of New York.

407,447 Underground electric conduit; Edward H. Phipps, New Haven, Conn.

407,454 Lightning arrester; James W. See, Hamilton, Ohio.

407,455 Electric cut-out; Adolph T. Smith, New York, N. Y.

407,460 Automatic telegraph. 407,461 Automatic telegraphy. 407,462 Automatic telegraph recorder; Frank Anderson, Peekskill, N. Y.

407,470 Circuit for electric railways; Henry H. Cutler, Newton, Mass.

407,477 Means for securing dishes to the tables of steamships; Frank Ezzel, Maranham, Brazil.

407,480 Relay for quadruplex telegraphs; Clarence L. Healy, Brooklyn, N. Y.

407,485 Multiple wire system of electrical distribution; James A. Lighthipe, Wilmington, Del., assignor to himself, George W. Bratton, Philadelphia, Pa., and Henry Nunez, New York, N. Y.

470,490 Electric signal; George McIntosh, Stonington, Conn.

407,496 Electrical railway; Sidney H Short, Denver, Colo., assignor to the United States Electric Company, same place.

407,581 Selecting telegraph; Mark W. Dewey, Syracuse, N. Y., assignor, by direct and mesne assignments, to the Dewey Corporation, same place.

407,593 Electric fixture; John C. Hollings, Boston, Mass.

407,618 Core for converters. 407,619 Electric meter; Marmaduke M. M. Slattery, Fort Wayne, Ind., assignor to the Fort Wayne Electric Light Company, same place.

407,689 Charging system for secondary batteries; Andrew L. Riker, New York, N. Y.

407,692 Autograph telegraph; James H. Robertson, Rutherford, N. J., assignor to the Writing Telegraph Company of New York.

407,729 407,730 Printing telegraph; Clarence L. Healy, Brooklyn, assignor to the Commercial Telegram Company, New York, N. Y.

407,745 Electrical railway; Sidney H. Short, Denver, Colo.

407,746 Water closet flushing valve (electric); John W. Stevens, St. Paul, Minn.

407,749 Extensible upward pressure contact arm; Charles J. Van Depoele, Lynn, Mass.

**SEALED PROPOSALS**

**For Lighting the Streets of Abilene, Kansas.** For specifications, address,

**JUDGE W. P. SEEDS, City Clerk.**

All bids must be received on or before August 15th.

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**TRUSTEE'S SALE**

In the matter of the dissolution of The Partz Electric Battery Company, Court of Common Pleas, No. 3, Philadelphia County, March Term, 1889, No. 894.

**ON TUESDAY, JULY 30th, 1889,**

—AT THE—

Philadelphia Exchange, cor. 3d & Walnut Sts., Phila,.
at 12 o'clock, will be sold at public sale,

**Letters Patent of the United States**

AS FOLLOWS:

No. 251,619, issued January 24, 1882, to A. F. W. Partz, for improvement in Voltaic Batteries.
No. 328,607, issued October 20, 1885, to A. F. W. Partz, for improvement in Liquids for Voltaic Batteries.
No. 347,440, issued August 17, 1886, to A. F. W. Partz, for improvement in Voltaic Batteries.
No. 353,757, issued December 7, 1886, to A. F. W. Partz, for improvement in Voltaic Bttteries.
No. 362,531 issued May 10, 1887, to A. F. W. Partz, for improvement in Voltaic Batteries.
No. 379,180, issued March 6, 1888, for improvement in Depolarizing Compounds.
ALSO, at the same time and place, will be sold for the same account, certain other assets.
*By order,*
WALTER GEORGE SMITH, Esq., Trustee.

**M. THOMAS & SONS, Auctioneers,**
*No. 136 So. 4th St., Phila.*

**WANTED.**—Engineer capable of taking charge of central station, containing Ball Engine and two half arc Brush Dynamos. Run on moon schedule. Write, stating experience, references and salary expected. Address,

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New England Office, ELECTRICAL REVIEW,
196 Summer Street, Boston.

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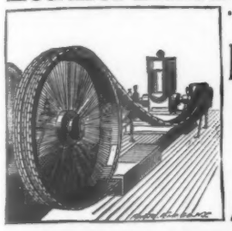
**Leather Link Belt Co.**



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Is the sole owner of U. S. Patents covering certain Electrical Gas-Lighting Burners, Cut-Offs, Burglar Alarm, Gas-Lighting Attachments, and other electrical appliances connected therewith, all of which are manufactured exclusively by him, and are sold to the trade on the most favorable terms. EXPERTS will use none other, on account of their superior workmanship, and practical utility.

Suits are now pending in the U. S. Circuit Courts against infringers of the Bogart Patents in the cities of New York, Philadelphia and Boston.

Illustrated Circulars, price-lists and discount sheets forwarded to the trade on application, accompanied with business card.

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LAMPS TO FIT ANY SYSTEM: ANY VOLTAGE OR CANDLE POWER.

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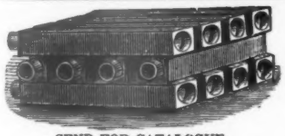

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"AXO" BATTERY COMPLETE with Jar adapted for Sealing.

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*CATALOGUE ON APPLICATION.*

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NEWPORT, R. I., March 11, 1887.

THE OKONITE COMPANY, 13 Park Row, New York City.

*Gentlemen:*—The sample of lead covered sent here for examination shows an insulation resistance of 1250 megohms per nautical mile after twenty-four hours in salt water. The insulation of one length of about 150 feet appears not to have been affected by immersion in salt water for two months.

The conductivity is 98⅝ per cent. of that of pure copper.

Respectfully, C. F. GOODRICH,
*Commander and Inspector of Ordnance in charge of Torpedo Station.*

In Dec., 1888, Commissioner Goodrich wrote fully corroborating the above.

SUB-MARINE
UNDER GROUND
AER IAL

EXECUTIVE OFFICE,
WESTERN UNION TELEGRAPH COMPANY.
NEW YORK, June 6, 1887.

*Dear Mr. Candee:*—Replying to yours of the 28th ult., my experience with the Okonite Core, for something over two years, has been very satisfactory.

I have yet to learn of the first case of deterioration of the core that has passed under my inspection, although, in amount, it figures up several hundred miles, and is used in both aerial and underground cables. Truly yours,

GEORGE A. HAMILTON.

CHAS. A. CHEEVER,
President.

WILLARD L. CANDEE,
Treasurer.

THE OKONITE CO'S

TRADE MARK

INSULATED WIRES & CABLES

NEW ENGLAND TELEPHONE & TELEGRAPH COMPANY,
50 Pearl St., BOSTON, MASS., April 11, 1887.

W. L. CANDEE, *Treas., The Okonite Co.*, New York.

*Dear Sir:*—It affords me pleasure to state that the Okonite Insulated Wires, furnished our Company during the past year, have given good satisfaction. Our tests (both practical and scientific) have been very severe, as to Insulation, Toughness and Durability. I cheerfully recommend it as a first-class Insulated Wire.

Yours truly,
J. N. KELLER,
*General Manager.*

January 9th, 1889, William J. Denver, then General Manager, wrote fully confirming the above.

13 PARK ROW, N. Y.

CHICAGO SECTIONAL ELECTRIC UNDERGROUND COMPANY,
Room 1022, Chicago Opera House Building,
CHICAGO March 27, 1886.

THE OKONITE COMPANY, New York.

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Yours truly,
F. W. CUSHING.
*Supt. Chicago Sectional Underground Co.*

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**National Theatre, Philadelphia, 1,000 lights.**
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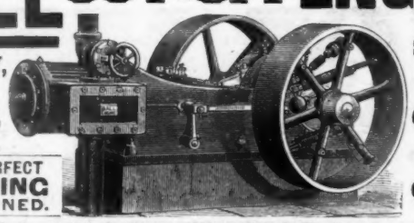

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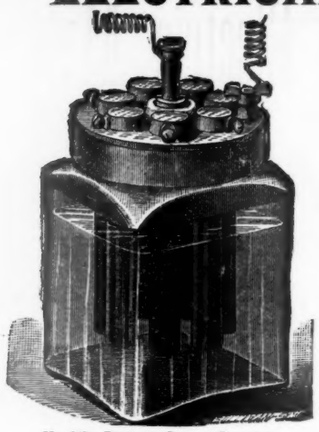

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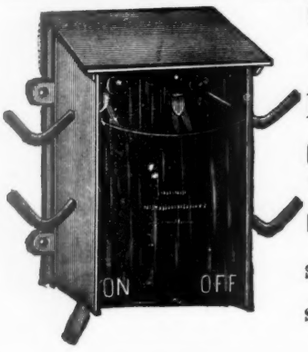


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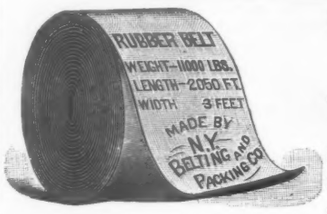


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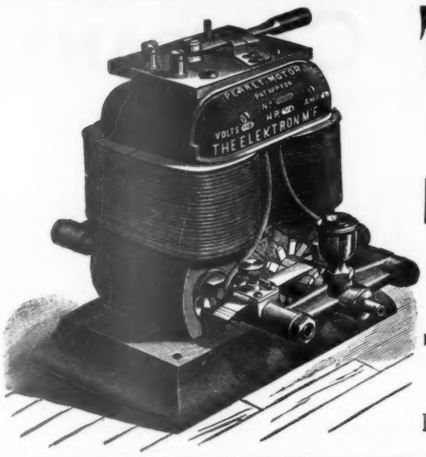


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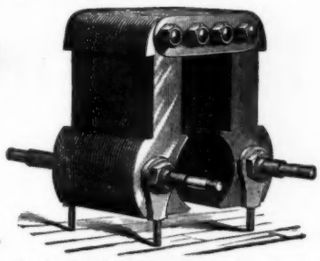

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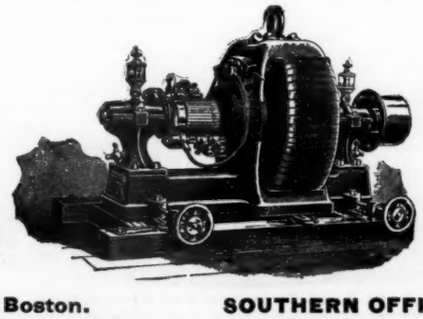

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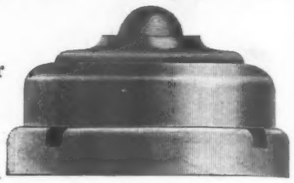

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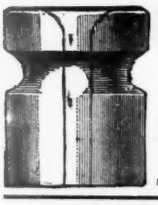

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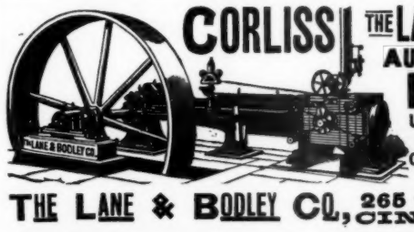


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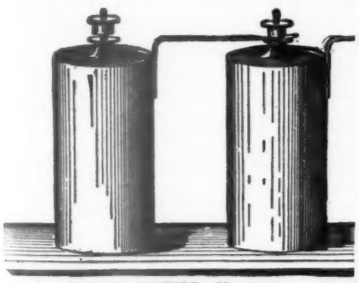

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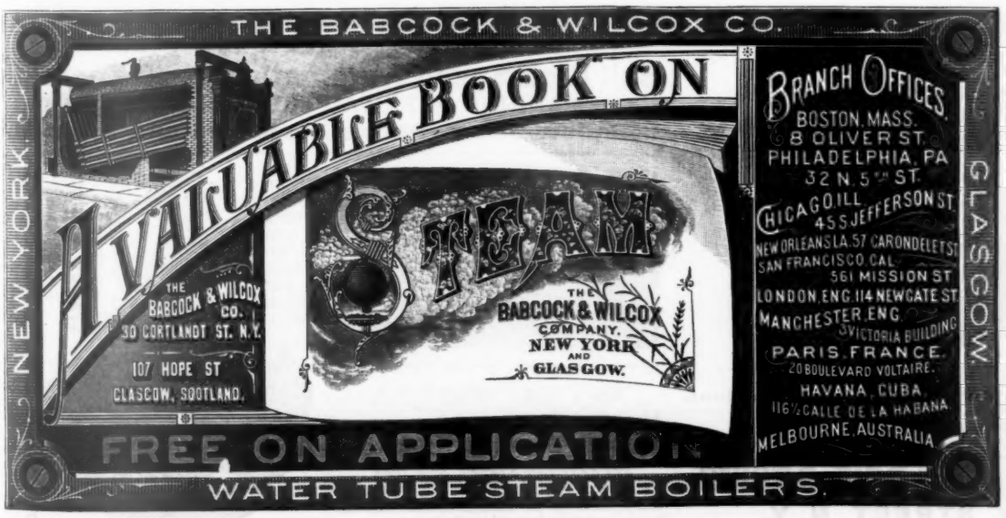
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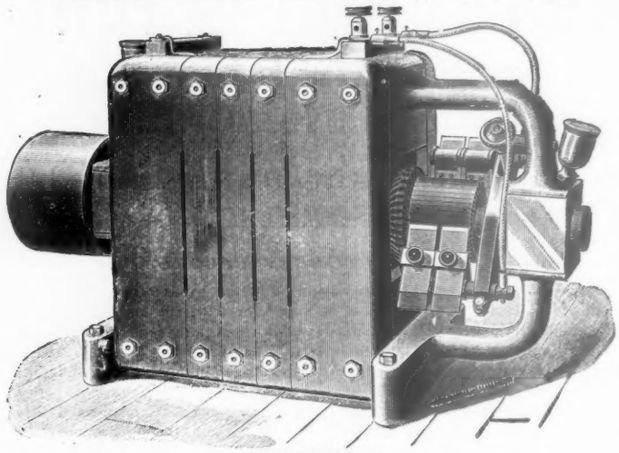

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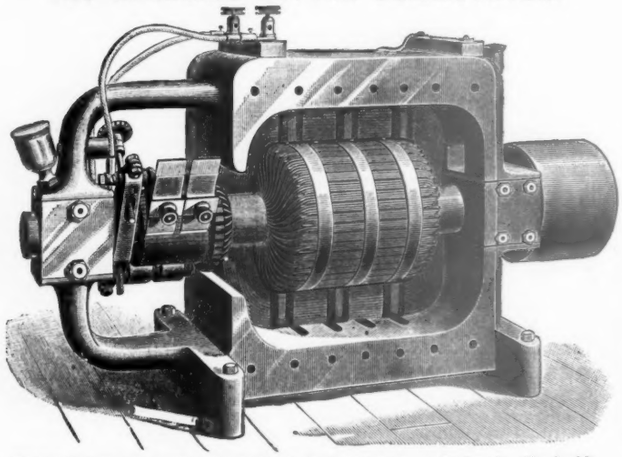

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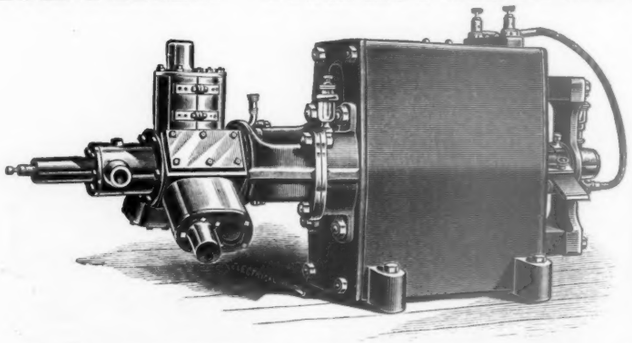

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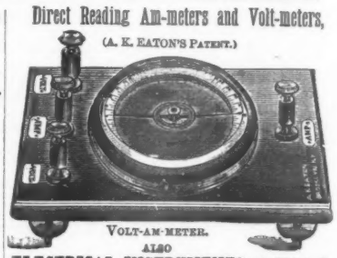

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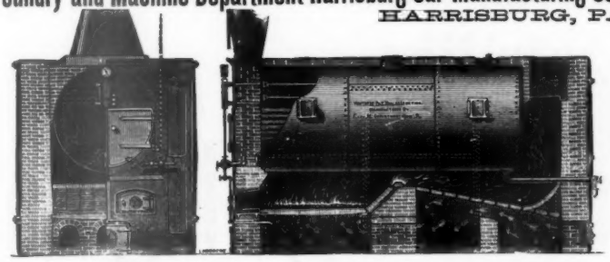

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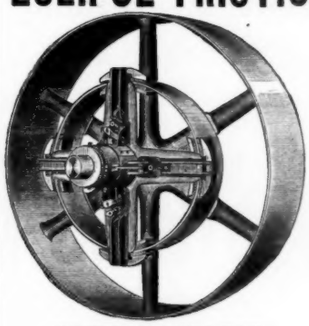

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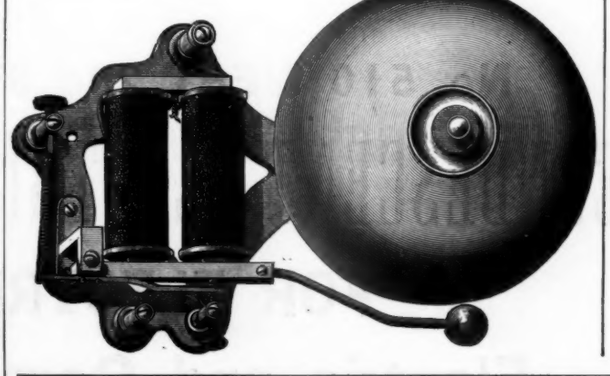

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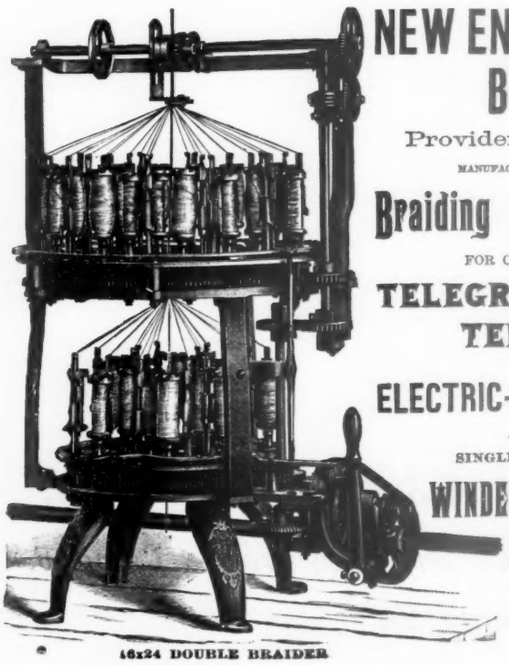

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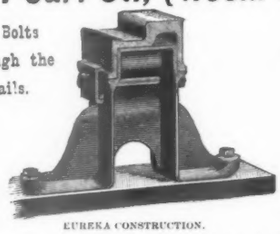

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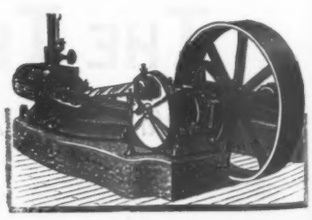

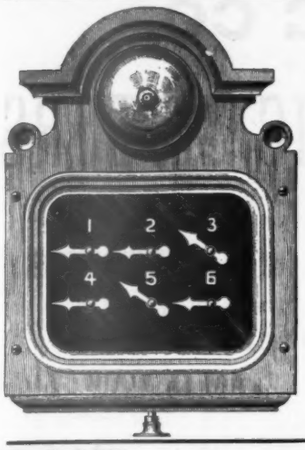

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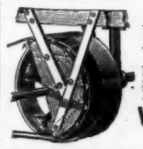

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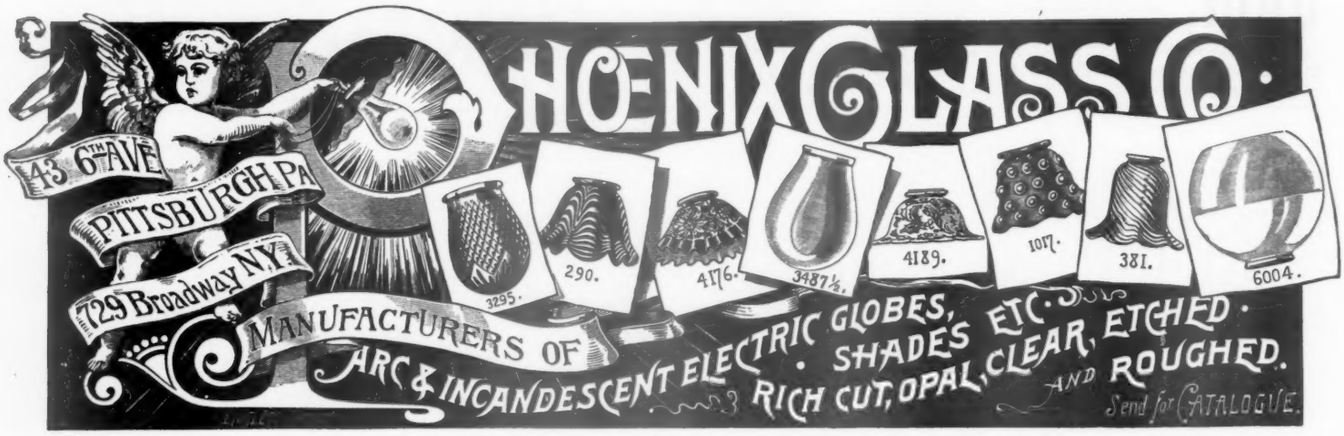


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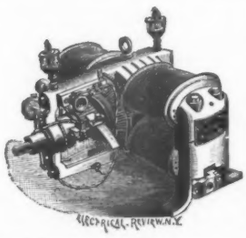

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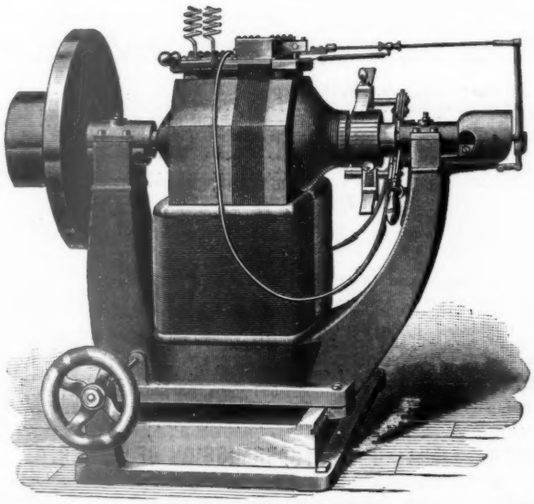

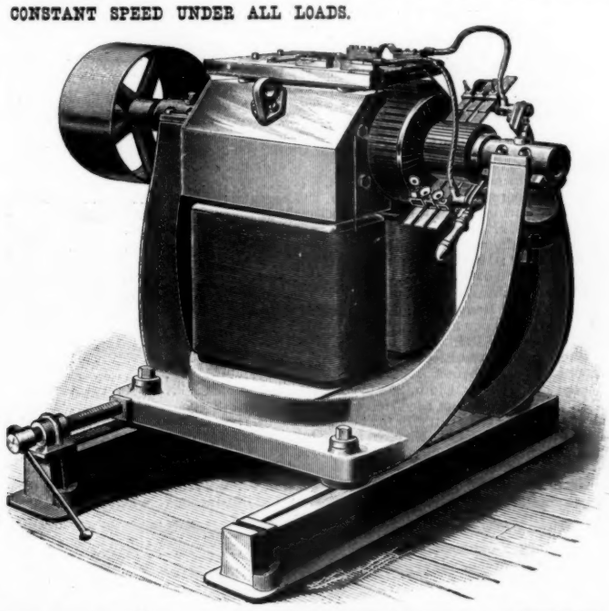

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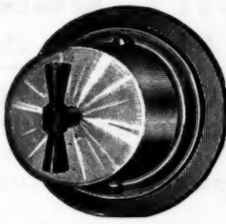

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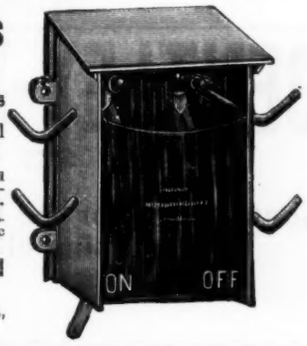


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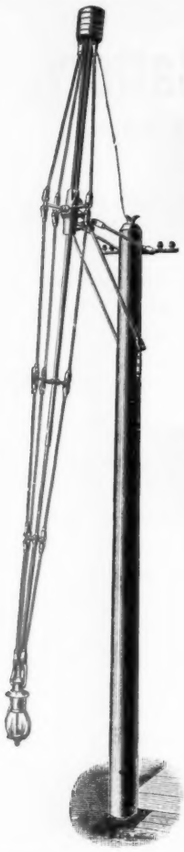

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